

**COSTA RICA-
PANAMA ARBITRATION**

**REPORT OF THE
CONSULTING ENGINEER
OF COSTA RICA
1913**



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COSTA RICA-PANAMA ARBITRATION

REPORT

SUBMITTED TO

THE REPRESENTATIVE OF COSTA RICA

BY

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CHAPTER I.

THE REPORT OF THE GEOLOGIST.

1. If the Report of the Commission of Engineers be examined with some care, especially in its declarative portion, it will be observed that it is based upon the opinions of the Geologist.¹

2. Before analyzing this document it is indispensable to determine precisely the limits of the territory personally explored and traversed by the Geologist, for the purpose of ascertaining what facts must be admitted as authentic, as being data gathered upon the ground, and at the same time excluding every item of information or fact in that report lying outside the boundaries of his personal inspection, for the reason that it was not obtained directly upon the ground but by reports, comparisons and unverified hypotheses.

3. The Geologist has exactly fixed those boundaries which we are now about to consider.

On page 8 he says: "The territory personally examined geologically * * * is contained between north latitude $9^{\circ} 35'$ and $9^{\circ} 38'$ and west longitude $82^{\circ} 38'$ and $82^{\circ} 60'$."

As we shall see further on (Chap. IV; Q. XIV, a), these boundaries exclude at once the territory from the mouth of the Sixaola, $82^{\circ} 34' 50''$ west of Greenwich to a half-mile to the west of Punta Mona, meridian $82^{\circ} 38'$ west, or a distance of 5,852 meters.

¹Report of Commission, p. 43.

On the other hand, he says: "Unfortunately the writer did not have time to thoroughly examine this upper valley except to make a hasty visit to the lower end of it."¹

This statement confines his personal inspection strictly to a hasty visit to the extreme lower end of the upper valley of the Sixaola; and on page 45 he indicates the separation of the two valleys into an upper part and a lower part and places the boundary between them at Piedra Grande, by saying "* * * that the division between these two parts is in the vicinity of Piedra Grande."² If the map presented by him is consulted it will be found that Piedra Grande is situated at $82^{\circ} 52' 30''$ west of Greenwich and $9^{\circ} 36'$ north latitude; from which it may be inferred that his personal inspection did not reach finally to the meridian of $82^{\circ} 60'$ as it is literally stated, but only as far as $82^{\circ} 52' 30''$ west of Greenwich, or, that is to say, over a territory embraced between $82^{\circ} 38'$ and $82^{\circ} 52' 30''$.

4. The Geologist excludes as a matter of fact all personal investigation in the region of Punta Mona, and within the whole of the territory which extends from Piedra Grande to the meridian of $83^{\circ} 30'$; that is to say, that his reconnaissance, which should have included the territory between the meridians of $82^{\circ} 34' 50''$ and $83^{\circ} 30'$, or a distance of fifty-five geographical miles, covered only the territory between the meridians of $82^{\circ} 38'$ and $82^{\circ} 52' 30''$, or fourteen and a half miles, and hardly three miles in latitude.

5. The accompanying map, Plate No. I, shows the territory explored by the Geologist between the boundaries that he himself fixed.

¹ Report of the Geologist, top of p. 46.

² Report of the Geologist, sec. 4, p. 45.

6. It was important that this matter be settled at the outset in order to find an explanation for the various anomalies observable in the report.

7. For the purposes of its consideration it will be convenient to divide that paper into three parts:

The first is occupied mainly with historical generalities of geology.

The second is devoted to the theory which has *recently* been prevalent as to the prehistoric formation of such ground.

The third is the practical portion, applied to the description of the territory.

8. The first two parts do not affect the question. It may even be conceded that the hypothetical submergence at some prehistoric date may have really taken place, but that does not prevent the present situation from being a different one.

9. For that reason everything that relates to the first two parts is excluded from the discussion in this paper in order to take up the third, or the conclusions and facts stated by the Geologist, but always within the boundaries he himself fixed as coming under his personal observation.

10. A simple inspection of the small area explored by the Geologist, marked by a rectangle in the accompanying map, Plate No. I, will be sufficient to show that it is not possible nor logical to accept any of the general principles that he lays down for the whole of the vast region that is to be considered. Geology is a science based upon observation and not upon deduction, and it is impossible to lay down rules covering a given region when only a small portion of it has been studied.

11. Hence it comes that the opinions of the Geologist in respect to the valleys of the tributaries of the Sixaola, or as to any other point outside of the limits fixed, cannot be taken into consideration.

12. In this same lower part of the Sixaola, the Geologist, doubtless without looking at the maps, either those prepared by the Commission or the one submitted by himself and, furthermore, without having been there, emphatically states:¹

“* * * the upbuilding of these natural levees, coupled with the 2.3 meters rise of the land, both brought about in late Pleistocene time, certainly some hundreds and possibly some thousands of years ago, have caused some of the former branches of the Sixaola River, such as Gadokan Creek, *to approximately parallel the main stream and flow out into the ocean instead of into the Sixaola* where it certainly formerly emptied * * *.”

and on the same page, 24, farther down he says:

“In prehistoric times, then, practically all of the creeks, including Gadokan and those northeast of it which now flow into the ocean, were tributaries of the Sixaola.”

13. On the contrary, the maps and reports declare that the sources of the Gadokan lie very far to the westward of the Sixaola; the Chief Engineer of Party A, Mr. Weakland, says (La Palma, May 19, 1912):

“We have established the fact that Gadokan Creek has no connection with the Sixaola and that it heads *more to the west than shown on any map we have.*”²

¹Appendix No. 2, p. 24.

²Appendix No. 3, p. 2.

14. The Commission, then, at the same time accepted the parallelism of the Gadokan and the Sixaola, *as laid down by the Geologist*, and the *net divergence* of the same, established by the Engineer of Party A, who visited personally and drew the course of the Gadokan.

The conclusions of the Commission reveal the fact that it was influenced by the opinion of the Geologist, who had not been upon the ground, and disregarded that of its own Engineer at the head of Party A.

15. The citation of these contradictions might be continued at great length, but a few of the more important will be sufficient.

On page 15, section D, the Geologist says:

“The percentage of run-off during the wet season is very large, because the rain falls much more rapidly than it can be absorbed by the ground, hence must run off.”

And ten pages further on (p. 25) he says:

“Many of the swamp areas are passable in the dry season, which may have one to three meters of water over them after heavy rains.”

16. The Geologist neglected to consider the evaporation, which is very great in that region, by reason of the high temperature that he himself noted there,¹ but as he also makes the assertion (p. 14) that the maximum rainfall in one year (1910) hardly reached 149 inches, or say 3.75 meters, we would have to suppose that the run-off, percolation, etc., be considered as *null*, together with a dam three

¹ Report of the Geologist, pp. 12 and 13.

meters high, keeping the waters permanently at that height. But it should also be noted that the 149 inches mentioned was the amount of rainfall for the entire year and not merely one heavy rain, as the Geologist intimates.

17. Summarizing the Report of the Geologist, it should be said that notwithstanding the anomalies thus far pointed out, he did state various actual and authentic facts in regard to that region. It is true that if he did state these facts, he did it with a view of applying his theories and hypotheses to them for the purpose of impeaching or denying their effect, and it has been necessary to divest them of the appearance they had, for recognition.

18. A few instances, among others that could be selected are as follows:

First. The Geologist lays it down, for example, that Punta Mona is found to be isolated from the rest of the main land by Swamp A lying between, but as he applies the theory of "*low saddles*," the result is that it is joined to the mainland.

Second. He says that Gadokan and other small streams discharge their waters directly into the ocean, but he subjects them to the submergence hypothesis and makes them in fact tributaries of the Sixaola.

Third. He alleges that the rocks of the Caribbean Coast are formed by coral growths, but insists upon reiterating the theory of a submergence, converting Punta Mona, which lies upon the Caribbean shores, into a homogeneous and integral part of the Main Cordillera, etc

19. If each of the above declarations is divested of the hypothesis by which it is impeached, then each one of them stands out as true and authentic by itself; thus:

1. It is a fact that Punta Mona is separated from the mainland by Swamp A.

2. It is a fact that Gadokan, Middle Creek, Punta Mona Creek, Manzanillo Creek, Taiodi, Cocles and other small streams do discharge their waters directly into the ocean and take their rise upon a basin that is distinct from that of the Sixaola.

3. It is a fact that the rocks forming Punta Mona are those usual upon the Caribbean Coast (the *Antillita* of Gabb), coral, and sedimentary formations that have no relation to the basic or crystalline rocks of the Main Cordillera.

20. In the course of this paper each one of the points of the Report of the Geologist that ought to be discussed will be examined. But, as will be seen at the proper place, the meteorological data submitted by the Geologist, from observations continued over a period of six years, were not used by him nor by the Commission for the purpose of seeing whether his assertions were or were not well founded. If such data had been considered, the hypotheses of the Commission would have in great part broken down, giving way to the real facts, proved by these very data.

21. The sole purpose of the examination that is now taken up, is to bring out the truth, using solely and exclusively the data and facts furnished by the reports under discussion.

22. It would have been possible to have had recourse besides to other sources and to other means in order to

establish the truth, but it was not necessary, and circumstances demanded a strict restriction to the data mentioned as being all that now may be considered to have a full legal status.

23. Thus stated, the foregoing chapter is the preamble to the examination that follows.

CHAPTER II.

THE REPORT OF THE COMMISSION.

(1) THE LOWER SIXAOIA.

1. This document contains 65 pages, of which 35 are devoted to administrative matters of the Commission and the remainder contain a description of the investigations made. The maps submitted are more explicit than the descriptions, but taking the maps and the report together the subject is so presented that by reference thereto it is very easy to answer the questions asked by the two contracting countries.

2. The matters included by the Commission in the appendices to the General Report, being the special reports of the heads of the technical sections in the localities examined, and which it embodied and embraced by its signature, are in the highest degree instructive, since the facts observed personally and individually are thus established and cannot be controverted.

3. It does not seem as if the Commission gave to these reports the importance which they really have, inasmuch as the conclusions reached by it are not based upon them. It is observed that in some cases the Commission, in communicating them, suppressed some phrases or ideas, but fortunately there exist and are to be found in the communicated documents, texts of the greatest value for clearing up and solving the problems submitted, the sole object of the work of the Commission.

4. The detailed statement of verified facts, made by the chief of Party A, in charge of the surveys and topography of the region embraced between Guabito and

Manzanillo, which appears in Appendix No. 3, is especially important in this matter; in the first place, because the Commission embodied and transmitted it; and second, because they are facts observed and deduced by the writer *in situ*, and communicated by him to the Commission, not as the final result of his work in that region, not as a conclusion, but as evident and actually observed facts, discussed and verified while engaged in the course of his investigations and not conceived upon the termination thereof.

5. The Commission while sitting, not in its headquarters at Sánchez, nor at Punta Mona, nor even at San José, where it had its central office, but at Evanston, and doubtless when it had finished in the latter place the drawing of the maps, located thereon a line that it felt authorized to call: "Line of a hypothetical divide arbitrarily drawn." That line does not exist.

6. According to the regulations for its internal operation, prepared by the Commission and approved at its Session, No. 17, of January 19, 1912,¹ the various chiefs of parties were required to draw out in the form and manner provided all the field notes taken during the previous three days in the course of their surveys.² That provision, as may be seen by the special reports of the four different chiefs of parties, was always complied with by them, and, referring to only one instance, among the many that could be cited, it appears that the chief of Party A reported³ that he had personally verified the fact that no connection whatever existed between the

¹Appendix No. 1, p. 102.

²Rule 18 of General Instructions: Appendix No. 1, p. 110.

³Appendix No. 3 to the General Report.

course of Gadokan Creek, throughout its entire length, and that of the River Sixaola.

7. It likewise appears that this same section chief arrived some days later at Punta Mona, but there is nothing to be found in his report showing that he met with any connection between that point and the interior of the region. If he had found any he would have reported it, as he did in the case of the low ridge of Gadokan, between this creek and the river; but on the contrary what he did report was, as shown by the maps and documents, marshy and low-lying lands, and the great swamp between Middle Creek and Manzanillo which extends over the whole south of Punta Mona.

8. This is the reason why it is mentioned here that it was at Evanston, and not at the places on the ground where the work was done, that the line traced was called the "Line of a hypothetical divide arbitrarily drawn."

9. The very name given to it by the Commission definitely excludes it from all argument, and if it were not that its creation might be detrimental to the interests of Costa Rica, the designation thus applied to it would be enough to cause it to be disregarded. We feel, therefore, compelled to discuss the basis of this *line assumed by the Commission*, which was also the *supposed frontier* that the French Arbitrator conceived.

10. In calling it "arbitrary," and "hypothetical," the Commission confirmed the fact that it was their imaginary creation, just as the spur that started out from Punta Mona was also an arbitrary and hypothetical creation.

11. If the supposition advanced in the French Arbitral Award in this respect had never existed, there would have been no room for the present discussions, and that arbitrary line would never have been imagined, at least in

the place where it is now located. Such a supposition may to a certain extent have been justified in the mind of the President of France when he drew up the Award of 1900, on account of the little or almost entire lack of knowledge then had of that littoral, but now, after the careful investigation and maps prepared by the Commission appointed by the Honorable Arbitrator and the contending countries, there is no ground for such a supposition, it not being, as the Commission asserts, "hypothetical" or "arbitrary," but simply replacing the line that the President of France thought existed. As to this, the General Report, the maps and the details submitted by the Commission, could not be more eloquent or decisive, for they clearly and definitively show that the line supposed by the Arbitral Award to exist was a "hypothetical and arbitrary line."

12. The best explanation regarding this and covering this point was furnished by the commissioner Mr. Hodgdon, in his special report, where he speaks of establishing the fact that the little streams of Gadokan, Middle Creek, Manzanillo and others, discharge their waters "directly into the Ocean," and without any connection with the Sixaola or with its valley.¹

Having set forth this preamble, let the facts now be examined.

13. Plan No. 2, Sheet No. 2: "A map of the eastern portion of the region covered by surveys in 1912," upon a scale of 1:10,000, definitely marks a line separating throughout its entire extension the basins of the Sixaola and of the Gadokan. This line begins upon the map exactly on the meridian of $82^{\circ} 40'$ and at $9^{\circ} 35' 20''$ north latitude, and it ends upon the Atlantic Coast to the west

¹Supplemental Report of Mr. Hodgdon, p. 5.

of the outlet of the Sixaola at $82^{\circ} 34' 39''$ west of Greenwich, and $9^{\circ} 35'$ north latitude. This line, from its starting point upon this map, follows a ridge, the contours of which indicate an elevation of about fifty meters, to the parallel of $9^{\circ} 34'$, at longitude $82^{\circ} 39' 20''$ west; where no contours nor details of elevation appear upon the plan, but the course of the Gadokan is indicated and the ridge continues until it terminates at the coast.

14. Sheet No. 1 of the same map shows the continuation of the ridge indicated upon Sheet No. 2, and upon the same scale 1:10,000, from a point designated $82^{\circ} 40'$ west, and $9^{\circ} 35' 20''$ north latitude, in a northerly course and almost upon the meridian $82^{\circ} 40'$ west to the parallel $9^{\circ} 35' 25''$ north, where the ridge takes a direction toward the northwest. Upon this course the ridge runs until it reaches the parallel of $9^{\circ} 36'$, at a point the longitude of which is $82^{\circ} 40' 45''$ west, and the elevation of which is marked upon the map at a height of 100 meters. From this point the direction of the ridge continues to the northwest at elevations between 50 and 100 meters; but another divide also appears starting out from that same point, taking a course nearly north, over hilltops, the elevation of which is not greater than 50 meters, and with depressions as low as about 10 meters above sea level, as may be seen by referring to the point where this new divide crosses the intersection of longitude $82^{\circ} 49' 39''$ west, with the parallel of $9^{\circ} 36' 30''$ north latitude,¹ and which is distant one kilometer from the

¹The writer of this report takes this method in all cases to indicate the point to which allusion is made and thus avoids making any sign, mark or annotation that might in any way disfigure the original map of the Commission, which is thus left intact.

starting point taken. From this depression the line rises again to the extremity of the ridge, the next level curve being 150 meters, and it reaches a height of 193 meters at Station A-1239. This culminating point is only distant 830 meters from another situated to the northwest, the elevation of which is 169 meters, marked upon the map as Station A-1261, and distant from the coast, in a straight line toward the sea in a northerly direction, only 1,760 meters; but this point upon the coast, as may be seen by a reference to the map, lies 6,000 meters to the west from Punta Mona; that is to say, still further west than Manzanillo.

15. This other divide which we left at Station A-1239, and which began at the point before cited, $82^{\circ} 40' 45''$ and $9^{\circ} 36'$ north latitude, is indicated upon the maps by a double continuous black line, and the Commission designate it: "Divide which is the north limit of the area which drains into the Atlantic further south than Punta Mona," in order to expressly and deliberately distinguish it from the divide that is marked by a single continuous black line, and which is entitled: "Divide which is the north limit of the drainage area of the Sixaola River;" and to differentiate it yet more clearly and precisely from the divide marked with a double line of black dashes, and which is called: "Line of a hypothetical divide arbitrarily drawn across Swamp A."

16. This other divide, we repeat, instead of continuing in the direction which has been described and which to a certain degree seems the most logical, inasmuch as it runs along higher elevations, and is consequently better visible and more certain, to the point already mentioned at the height of 169 meters, at Station A-1261, which is distant from the coast only 1,760 meters, although

the Commission has indicated it as a "divide" differing from the one that bounds upon the north the Valley of the Sixaola, is continued by the Commission, not forward but rather backward and carrying it to the east, some distance still further to the south, until it reaches, after running a distance of 2,500 meters, a point yet lower than the one just indicated (169 meters), since it only has a height of 90 meters and is situated at $82^{\circ} 39'$ west longitude and $9^{\circ} 36' 40''$ north latitude, or more exactly at $82^{\circ} 38' 57''$ west longitude and $9^{\circ} 36' 43''$ north latitude, whilst the point A-1261 at the height of 169 meters, distant from A-1239 only 830 meters, is situated at $82^{\circ} 40' 34''$ west longitude and $9^{\circ} 37' 26''$ north latitude.

17. From the point having an elevation of 90 meters, the line descends, running toward the north, to the parallel of $9^{\circ} 37'$, at longitude $82^{\circ} 38' 54''$ west, where it is on the edge of the marsh; thence in a northeast direction it traverses the entire marsh to the parallel of $9^{\circ} 38'$ at longitude $82^{\circ} 38' 06''$, where a little hill rises that ends in Punta Mona, and there also the divide that is being traced terminates.

18. The separation of this divide, which, according to the maps, is hypothetical and arbitrary, not only across Swamp A, but also after it leaves Station A-1239, is very logical, and the comparison that is made between the hypothetical tracing marked upon the maps and the more accurate one shown by these very same maps, along greater elevations and nearer to the coast, was simply with the purpose of confirming the appellation given to that divide, as a "hypothetical and arbitrary line."

19. So that, among all the numerous facts and data furnished by the report of the Commission of Engineers in

justification of the rights claimed by Costa Rica, there is none better, clearer or more convincing than the one shown by the maps at the precise point being analysed in this report.

20. In fact, plan No. 2, sheet No. 2, ends toward the north at the point we have noted as the "divide," at the intersection of $82^{\circ} 40'$ west longitude and $9^{\circ} 35' 20''$ north latitude. From this point onward map No. 2, sheet No. 1, shows the continuation of said actual divide from the basin of the Sixaola upon the north. This divide runs thence upon the same meridian of $82^{\circ} 40'$ to the parallel of $9^{\circ} 35' 25''$, where the divide bends toward the northwest and on this course is found the point at the intersection of $82^{\circ} 40' 46''$ and $9^{\circ} 36'$, where the other divide starts that is distinguished by the Commission as the ridge that bounds upon the north the drainage area that is "further south than Punta Mona," and which, as has been seen, is hypothetical and arbitrary. The result is, therefore, that looking at the maps, there are to be seen at the same time and to a certain extent parallel, *two divides*; the first one close to the bed of the Sixaola, being the real and actual one that limits the basin of this river upon the north; whilst the second one, beginning at the point mentioned, proceeds by a very long and winding course, hypothetical and arbitrary, toward Punta Mona. That is to say, there are *two divides* of the Sixaola Valley upon the north, on the same side of that stream; one of them cutting the meridian of $82^{\circ} 40'$ at the parallel of $9^{\circ} 35' 24''$, and the other cutting the same meridian of $82^{\circ} 40'$ at the parallel of $9^{\circ} 37' 04''$, the distance between them being 3,000 meters.

21. This undeniable fact, unanimously stated and subscribed to by the entire Commission of Engineers, brings into clearer relief than others that might be cited the fact

that, even supposing and conceding that the hypothetical divide of the Commission did exist, there exists at the same time another real divide, which, closer to the course of the Sixaola, closes the basin of this river before the former one; but this real divide does not enjoy the privilege of terminating at nor does it run to Punta Mona, for it ends just to the west of the outlet of the Sixaola into the ocean.

22. The Commissioner, Mr. Hodgdon, in his supplemental report, had the honor of corroborating this fundamental fact, while establishing those that were derived therefrom; that is, that various creeks, including the Gadokan and others farther to the west of Manzanillo, empty their waters directly into the ocean, without any connection with the Sixaola¹.

23. The fact could not be otherwise, for it is shown by the documents presented by the Commission, the report or reports of the Engineer of Section A, that he personally examined this portion of the territory, and he says, among other things:² "We have established the fact that the Gadokan Creek has no connection with the Sixaola and that it heads more to the west than shown on any map we have;" and he reiterates it when he says:³ "I walked over the ground between the Creek Gadokan and the Sixaola and satisfied myself that there is no connection between them."

24. Evidence of all these statements will be found recorded upon the maps, where the divide shown by a continuous line is extended until it ends at the coast to the west of the mouth of the Sixaola.

¹Report of Mr. Hodgdon, p. 5.

²Appendix No. 3, p. 2.

³Appendix No. 3, p. 3.

25. There exists another divide, also, equal to the foregoing, between Gadokan and Middle Creek, which the maps do not indicate, but which is known to all those who travel on foot or upon horseback between Punta Mona and Guabito.

26. Based upon new mathematical data furnished by the investigations of the Commission, other conclusions may be deduced no less important. One is that the delta of the Sixaola, which up to the present time has been understood to extend to near the mouth of Gadokan Creek, is confined to its own actual mouth and very close to which the divide, indicated upon the maps by a broken line, terminates.

27. There is no doubt that these points, inasmuch as they are easily accessible, were recognized at the outset of the work of the Commission, and if it were not that it is presumed the Commission prudently thought it well to gather the fullest data possible in order to facilitate the solution of the problem it might be alleged that the Commission had exceeded the powers committed to it by the Honorable Chief Justice, the Arbitrator in this litigation, who, in accordance with the Treaty, limited the investigations of the Commission to the "line that closes on the north the Valley of the Sixaola," and not the *basin of the Sixaola*.

28. The Commission, having recognized the fact settled by Mr. Hodgdon¹, that the little streams which run, from the Gadokan, inclusive, toward the west, are *independent of the Sixaola* and discharge their waters *directly into the ocean*, should have refrained from taking the whole of that region into consideration, and if deemed to have

¹Report, p. 5.

a place on the maps, the region should have been included therein merely by way of illustration and nothing more.

29. Still, upon the maps, and in the descriptions more especially, a tendency may be noted to assimilate the basin upon which Punta Mona is found, *a watershed that drains directly into the ocean*, to the basin of the Sixaola. To arrive at this the maps say: "Divide which is the north limit of the drainage area of the Sixaola River when that river and Gadokan Creek are at low stages, but which may be submerged in portions and hence is not a divide when either the Sixaola River or Gadokan Creek is at a high stage and their waters mingle."

30. Before going thoroughly into this classification *sui generis*, let us state parenthetically in the fewest possible words two ideas, which are essentially identical and yet are interpreted by the Commission in a diametrically opposite sense.

31. The Commission, relying upon the opinion of the Geologist, accepted the conclusion that the hypothetical divide that appears upon the maps, proceeding across Swamp A, toward Punta Mona, *ought to be considered*, although a great part of it is constantly submerged below the level of the waters of the swamp. The strongest reason adduced was that in some prehistoric period that territory was buried at a depth of 120 meters,¹ and, consequently, not Punta Mona alone, but also the islet lying in front of it, formed the termination of a high and visible divide; and the Commission, contradicting the very language of the reports made by its Engineer of Party A, showing that *no connection* exists between the Gadokan and the Sixaola, says that the divide between these two water-courses *must not be considered*, when both streams

¹ Report of the Geologist p. 21.

flood the land near their discharge outlets; that is to say, a divide must not be considered when it is submerged, although not constantly, like the above, but by the simple rising of the waters.

32. So that what must be accepted as an accomplished fact, because it was so in some prehistoric epoch, must not be accepted as an accomplished fact, because it is so during the present epoch.

33. The two facts are identical and yet the conclusions put forth by the Commission are diametrically opposed: in the first case it accepts, and in the second case, precisely the same, it denies. Going to the bottom of the matter and stating it succinctly: in one case a fact is supported that is injurious to Costa Rica, and in the other and like case it is rejected when it favors Costa Rica.

34. This disposes of the parenthetical matter and, returning again to the question, it is very noticeable that there is, both upon the maps and in the descriptions, a tendency to assimilate what we know under the name of "Manzanillo Basin" with the "Sixaola Basin." The argument adduced for this is condensed by the Commissioner, Mr. Hodgdon, in his supplementary report, by saying that the Gadokan, Middle Creek and all the other little streams that discharge during flood periods into the ocean, ought to be considered as tributaries of the Sixaola, because by the rains the course of the Sixaola and the courses of those creeks become mingled.

35. The argument is not a consistent one and it is one that could be used to assert that the Mississippi is a tributary of the Rio Grande del Norte, because both empty into the Gulf of Mexico. And the most remarkable thing is that if we were very careful as to the significance of the word "tributary" it would be found that in the case before

us, the flow of the Gadokan being extremely small in comparison to that of the Sixaola, in cases of floods it would not be the Gadokan that would pour into the Sixaola, but a part of the waters from the Sixaola would be found to go to swell those of the Gadokan, so that the former would then be a tributary of the latter, and not the latter a tributary of the former.

36. So, while the Commission as a body, termed simply "low saddles" the submerged part that it supposed ran and terminated at Punta Mona, in accord with the Geologist who asserted that "In geological studies it is a very common thing to find low saddles in divides,"¹ why was not this same dictum applied to the divide that exists between Gadokan and the Sixaola? And let it be especially noted that this "low saddle" is *always submerged*, while that between the Gadokan and the Sixaola is visible throughout the dry season and is only submerged during high floods in the rivers, as the Commission asserts in its hypothesis.

37. But the very climax of this whole matter is that the divide which is sought to be imposed, to end at Punta Mona, and which is supported and maintained by the very same arguments by which the other divide is rejected, is not the divide that closes upon the north the valley of the Sixaola.

38. If, as this Commission declares, the divide that runs hypothetically toward Punta Mona is simply *the line that limits the drainage area toward the Atlantic,*² *farther south than Punta Mona*, what is to be done with this divide thus categorically defined, existent or not, which not corresponding, either with the description or the explicit conditions set forth by the French Award,

¹Report of the Geologist, p. 19.

²See the legend upon the maps.

ought not to be given any consideration whatever? There is no object in further discussion or denial of that point after the Commission has officially declared that this is not the divide that separates upon the north the valley of the Sixaola.

39. If it exists, it is not the one meant by the French Award, and if its existence is merely hypothetical and arbitrary, worse yet. That it was delineated finally in a hypothetical form, that such hypothesis came to have some semblance of reality, even so, the result is, as defined by the Commission: *a new divide which limits solely and only the drainage area toward the Atlantic further south than Punta Mona, and which starts and separates itself from the crest that forms the divide of the Sixaola upon the north.*

It is not possible to controvert these fundamental facts that are laid down by the Commission.

40. The appended map, Plate No. II, will show at a glance all the details that have been discussed. In this the positions of the important points that relate thereto have been preserved as they were laid down upon the maps of the Commission, and the same conventional signs were adopted as used by it to indicate the divide of the Sixaola, the divide of the area to the south of Punta Mona, etc., while making use of a new conventional sign to express something not already defined upon the maps.

(2) THE LOWER SIXAOLA (CONTINUATION).

41. Up to this point the examination of the Commission's Report, has dealt with certain strange and inexplicable items proposed by it.

42. They are inexplicable, because the Honorable Chief Justice, with great foresight, at an opportune moment, brought to the knowledge of the Commission the

original text of the French Award of September 11, 1900, and it appears that the Commission took full notice of it at its eighth session, held in Washington, D. C., on November 23, 1911.¹

43. The perusal of that document reveals the fact that it does not refer to "*a line* that closes on the North the *basin* of the Sixaola" but to "*a line* that closes on the North the *valley* of the River Tarire or Sixaola." Here are two different and quite distinct ideas, particularly when expressed in technical language.

44. It is well to ask here, before going into the matter, whether the four notable engineers who made up the Commission confused the meaning of "*valley*" and "*basin*" and whether these two terms were by them considered synonymous.

45. Such a thing cannot be presumed. Synonyms have their limits and those engineers knew how to distinguish perfectly between what was a *valley* and what was a *basin*; and the maps they presented are a proof of this fact. It is true that Colombia formerly, and afterwards Panama, sought to make these two terms synonymous, when this question was discussed subsequent to the delivery of the French Award, which was confined to "* * * the line that closes the *valley* * * *" and not the one closing the *basin* (in French *vallée*, not *bassin*).

46. Happily, the maps furnished by the Commission are delineated in such a way that by a simple glance any one can separate the "*valley*" of the Sixaola from the "*basin*" of the Sixaola.

47. In separate documents, the Professor of Geology from Lehigh University, Pennsylvania, and the author of

¹Report, Vol. II; Appendix No. 1. Minutes, p. 31.

this report, have fully discussed the difference existing between "valley" and "basin," to which attention is called, showing that everybody understands that the "basin" is the whole of the watershed belonging to a river, to a lake or a sea, while the "valley" is limited to the lower portion of the basin, so to speak—the bottom of it.

48. Among the most notable naturalists, Figuier and Penck are in full accordance with the principle set forth, that the valley is constituted by the bottom of the depressions of hills and mountains.

49. The total depression between hills or mountains, that encloses or constitutes the valley or valleys and extends further on to embrace all the regions that discharge their waters into a given stream, is the basin or catchment-area of that stream.

50. The difference is so patent between the two ideas, "valley" and "basin," that the very first paragraph of the Loubet Award states them both, using different words. In the first case the frontier closes on the north the *valley* of the Sixaola; and in the second it is the line that divides the watersheds of the two oceans. Greater clearness in two distinct ideas cannot be imagined.

51. Fortunately, as already indicated, the maps are so explicit that it is easy to trace upon them the line that closes upon the north the valley of the Sixaola.

(3) TRACING OF THE LINE THAT CLOSES UPON THE NORTH THE VALLEY OF THE SIXAOLA.

52. It is very certain that, notwithstanding all the theories that have been suggested in respect to the formation of valleys, no one has clearly defined where the *valley* ends and where the slope begins of the height that, taken together with the valley, constitutes the *basin*, since that

is a particular physical fact to be determined in each case and place; but such a line does exist in all valleys and may be definitely determined. All that is needed is to establish the transverse or cross-sections of the basin in question, perpendicular to the hydraulic axis of the current of the river. These cross-sections will furnish the different points of the line that is to be traced, and once located they may be transferred to the maps. These points, when joined, will form the line that closes the valley.

53. On the south side and the right bank of the Sixaola the cross-sections were not carried out, for it was on that side the Sixaola Valley stretched out and the limit there was not a subject of discussion, whilst upon the left bank the valley hardly amounts to anything, as may be seen by a reference to the maps and the line limiting that valley.

54. As will be observed further on, in discussing the Upper Teliri, the line that closes upon the north the valley of the Telire, ends at a point of which the co-ordinates are: $83^{\circ} 03' 20''$ west longitude and $9^{\circ} 35' 45''$ north latitude, where the Telire Valley terminates, and where the bed of the river becomes walled in between high mountains already forming a cañon.

55. Up to this point, also, the tracing of that line extends in the auxilliary map that is submitted.

CONCLUSION.

56. Considering all the data furnished by the Commission of Engineers, and in conformity with the language of the text of the French Award, *the line that closes upon the north the valley of the Sixaola*, being already indicated upon the map, the result is:

1. That such line does not start out from Punta Mona;

2. That such line does not follow any divide; and
3. That such line does not connect with a point or points of the Main Cordillera.

TRANSVERSE SECTIONS AT POINTS UPON THE SIXAOLA
AND TELIRI RIVERS.

The data for the transverse or cross-sections here presented were taken from the maps and profiles of the Commission of Engineers.

Azimuths, in all sections, were measured from point on the Sixaola River. (See "Explanation of Table," Item III.)

General scale adopted for all cross-sections:

Horizontal.....	I : 40,000
Vertical.....	I : 100

EXPLANATION OF TABLE.

DATA FOR POINT ON THE SIXAOLA RIVER.

- I. Section number.
- II. Name of place.
- III. Geographical location, longitude west of Greenwich and latitude north.
- IV. Elevations in meters above sea level:
 - (a) Bottom of the river.
 - (b) River at low water.
 - (c) River at high water.

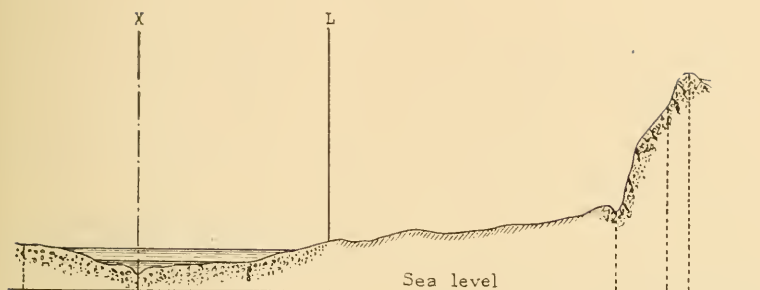
DATA FOR THE POINT LIMITING VALLEY ON THE NORTH
SIDE OF RIVER.

- V. Distance from hydraulic axis of river.
- VI. Azimuth.
- VII. Geographical location, same as above.
- VIII. Elevation in meters above sea level.

TABLE GIVING ALL DATA FOR TRANSVERSE SECTIONS.

I.	II.	III.			IV.		V.	VI.	VII.	VIII.
		Long.	Lat.	a	b	c				
1	Zavala Landing....	82 41 57	9 33 00	6	2	2	1,750	288	82 41 15	9 33 38
2	Nievecito.....	82 43 55	9 33 40	9	2	2	1,000	228	82 43 39	9 34 17
3	Paraíso.....	82 44 30	9 34 30	11	2	2	1,500	200	82 44 14	9 35 14
4	Dos Caños.....	82 45 00	9 35 00	14	2	2	1,000	180	82 45 00	9 35 32
5	Sánchez.....	82 46 40	9 35 28	18	2	2	1,200	170	82 46 36	9 36 05
6	Cuabre.....	82 48 10	9 37 00	24	2	4	450	180	82 48 10	9 37 14
7	Watzl.....	82 50 20	9 37 20	30	2	3	150	189	82 50 19	9 37 24
8	.....	82 51 00	9 36 40	34	2	2	150	180	82 51 00	9 36 45
9	P. Grande.....	82 52 00	9 35 40	37	4	4	2,100	180	82 52 00	9 36 48
9A	"	82 52 00	9 36 30	35	3	5	Valley restricted by dikes.			
9B	"	82 52 30	9 36 16	39	2	3	"	"	"	
9C	"	82 52 50	9 36 10	40	2	3	"	"	"	
10	Yorkin.....	82 53 20	9 34 30	43	3	3	350	90	82 53 31	9 34 30
11	.....	82 55 00	9 33 40	46	3	2	250	180	82 55 00	9 33 45
12	Suretka.....	82 56 30	9 34 30	54	2	3	500	190	82 56 47	9 34 45
13	Shiroli.....	82 58 20	9 34 40	63	2	3	700	190	82 58 14	9 35 12
14	.....	83 00 00	9 34 40	83	2	3	350	190	83 00 00	9 34 50
15	Sirukicha.....	83 03 20	9 35 45	112	2	3	10	190	83 03 30	9 35 45
16	Cañon.....	83 05 00	9 36 10	116	2	3	10	180	83 05 00	9 36 10

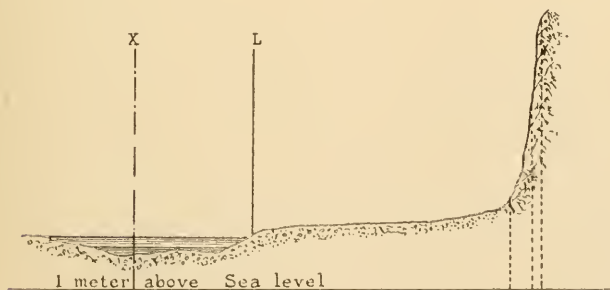
CROSS-SECTION No. 1.
ZAVALA LANDING.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

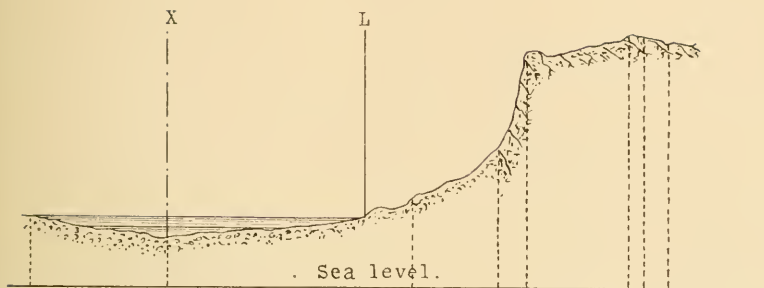
CROSS-SECTION No. 2.
NIEVECITO.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

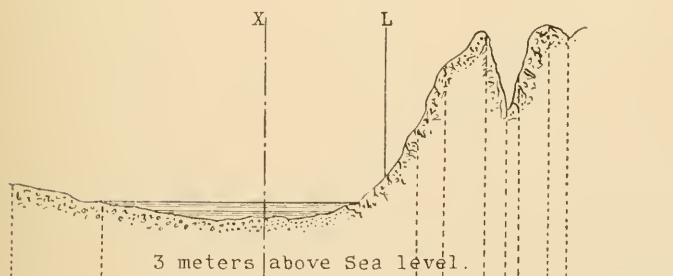
CROSS-SECTION No. 3.
PARAISO.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

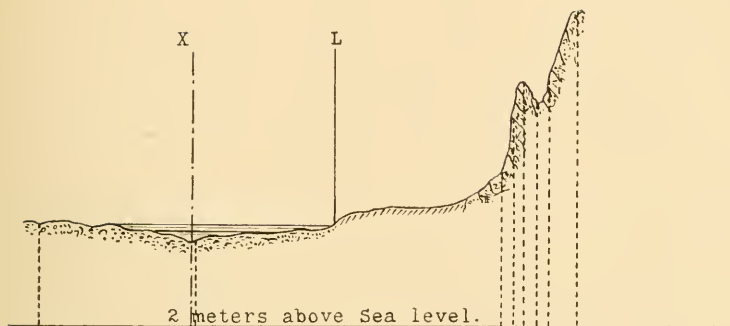
CROSS-SECTION No. 4.
DOS CAÑOS.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

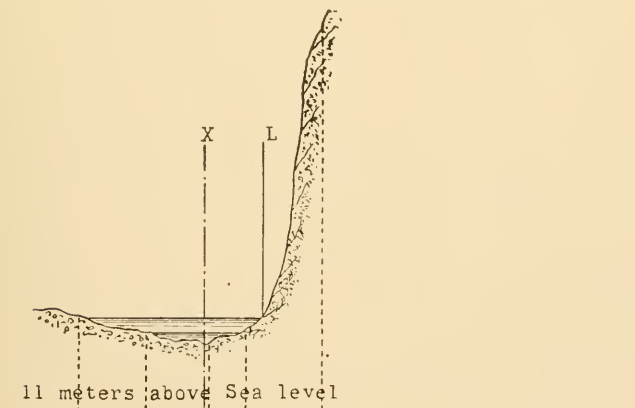
CROSS-SECTION No. 5.
SANCHEZ.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

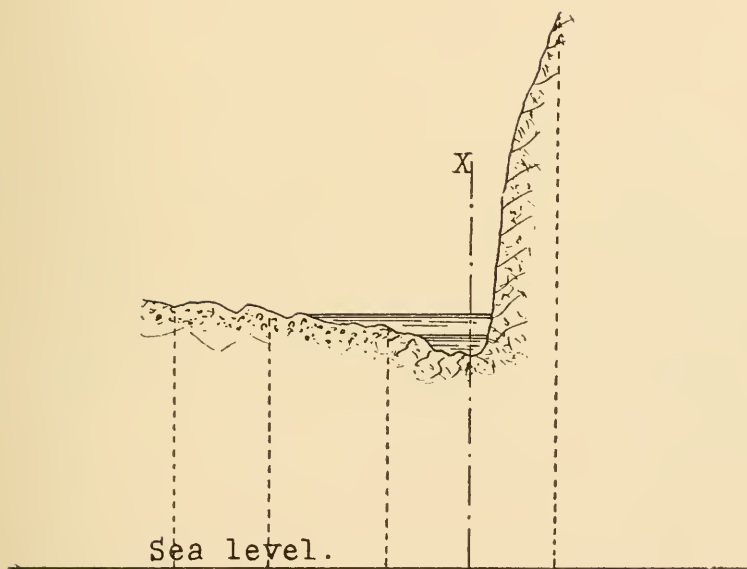
CROSS-SECTION No. 6.
CUABRE.



X, Hydraulic axis of river.

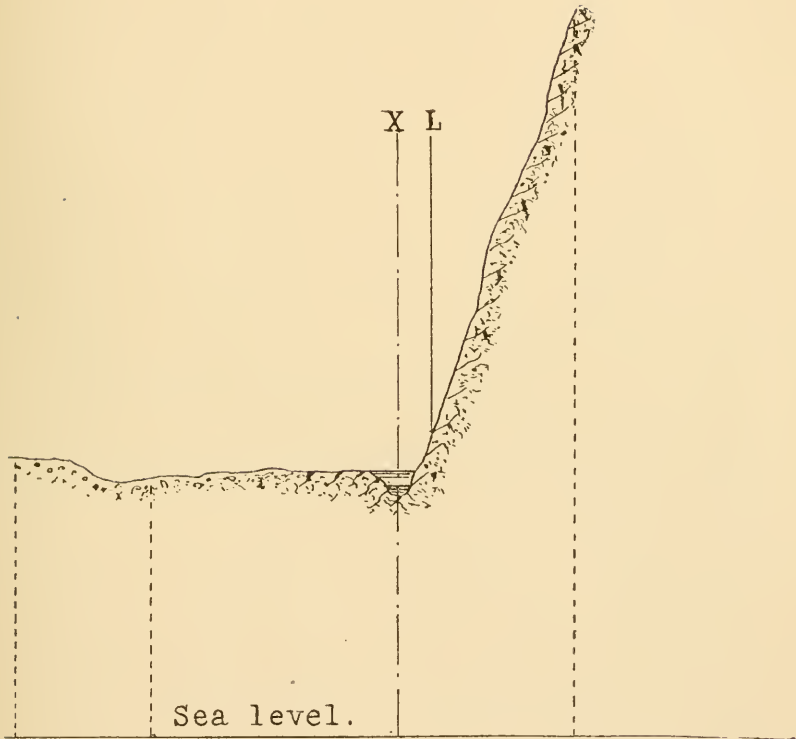
L, Point limiting valley on north side of river.

CROSS-SECTION NO. 7.
WATZI.



X, Hydraulic axis of river.

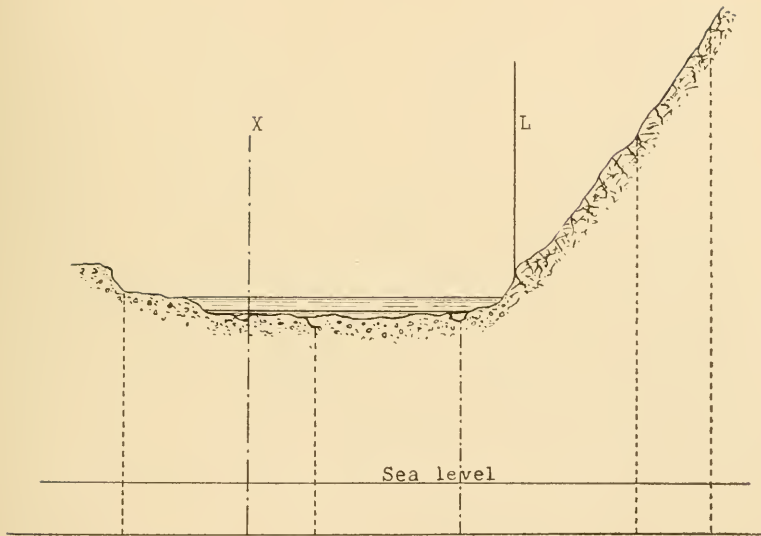
CROSS-SECTION NO. 8.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

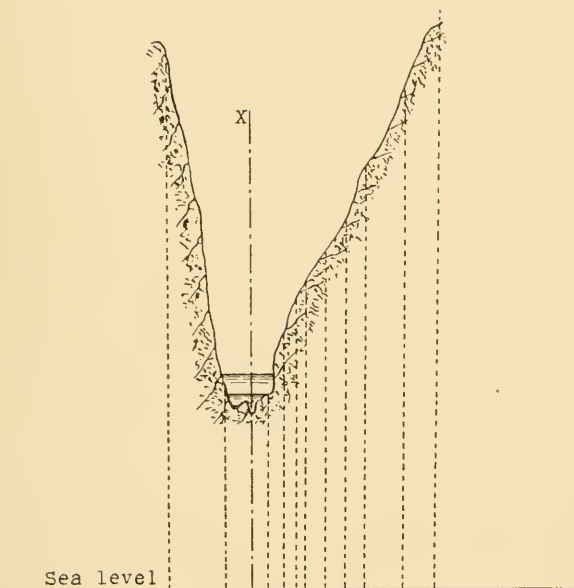
CROSS-SECTION NO. 9.
PIEDRA GRANDE.



X, Hydraulic axis of river.

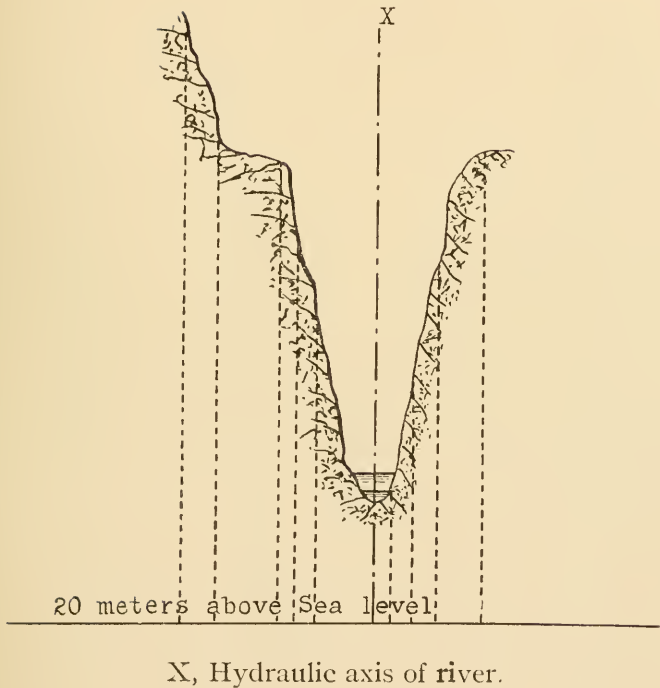
L, Point limiting valley on north side of river.

CROSS-SECTION No. 9A.
PIEDRA GRADE.

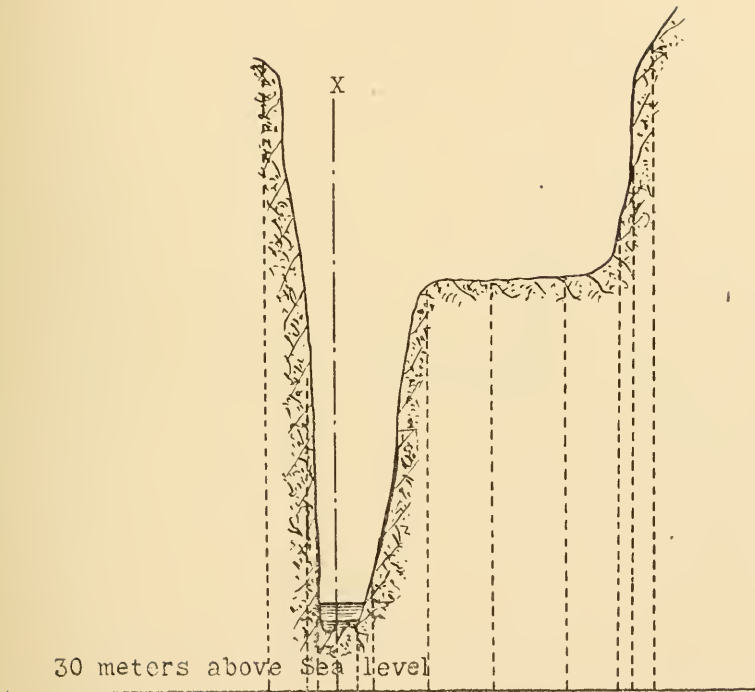


X, Hydraulic axis of river.

CROSS-SECTION NO. 9B.
PIEDRA GRANDE.

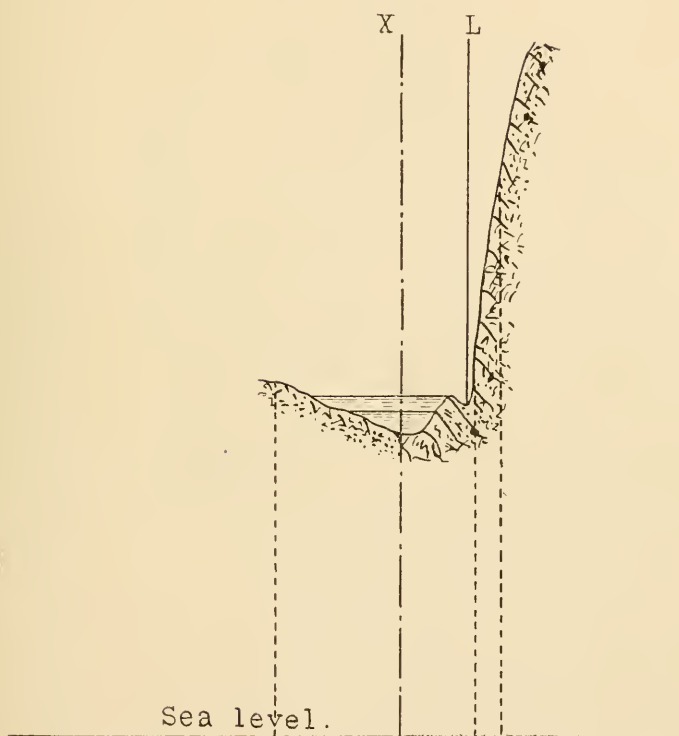


CROSS-SECTION No. 9C.
PIEDRA GRANDE.



X, Hydraulic axis of river.

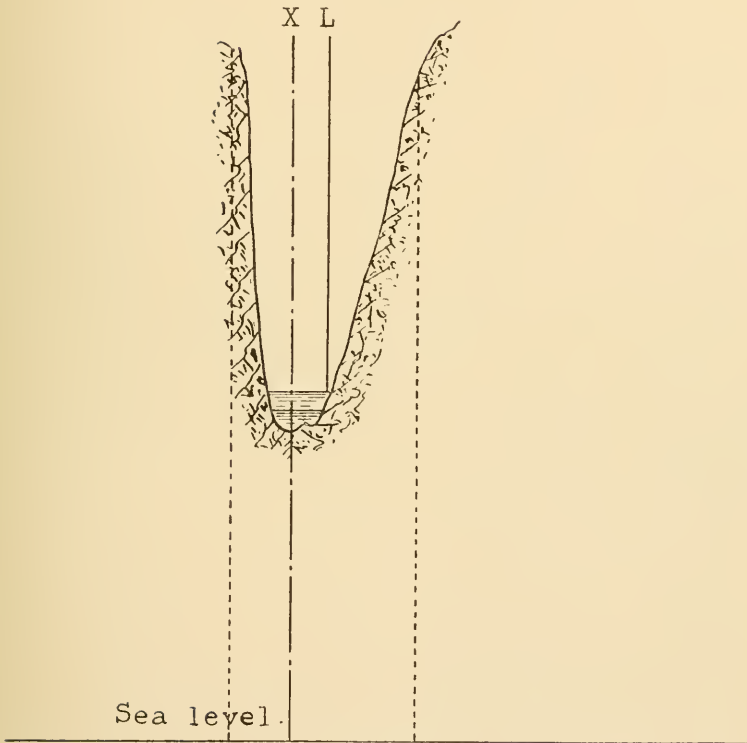
CROSS-SECTION No. 10.
YORKIN.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

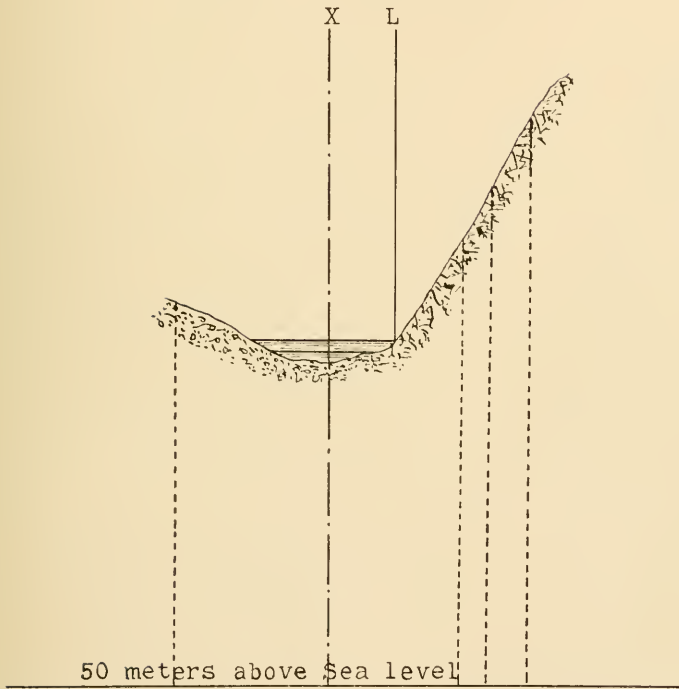
CROSS-SECTION NO. 11.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

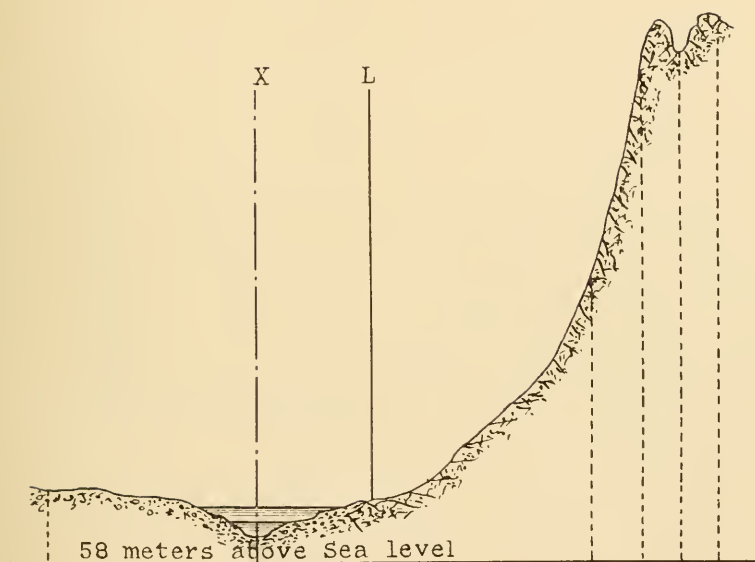
CROSS-SECTION NO. 12.
SURETKA.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

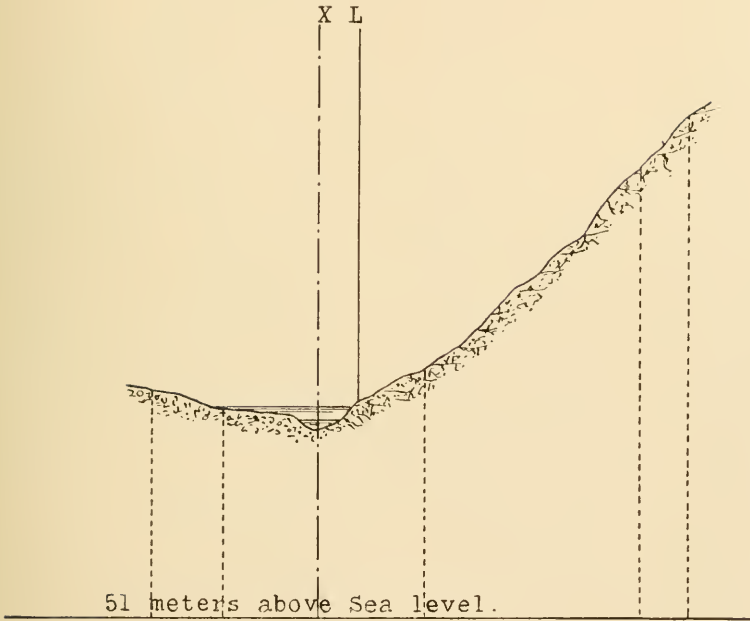
CROSS-SECTION NO. 13.
SHIROLI.



X, Hydraulic axis of river.

L, Point limiting valley on north side of river.

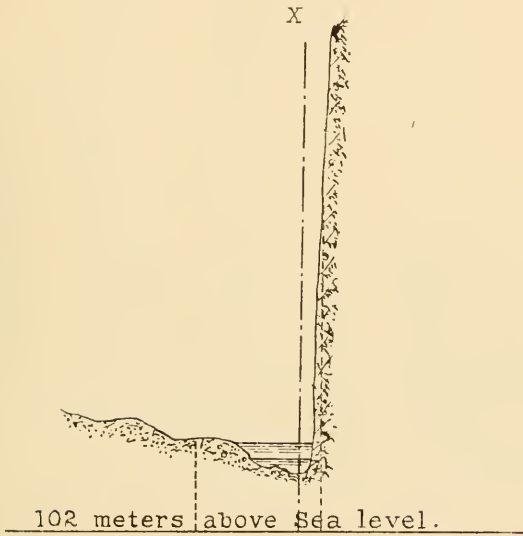
CROSS-SECTION NO. 14.



X, Hydraulic axis of river.

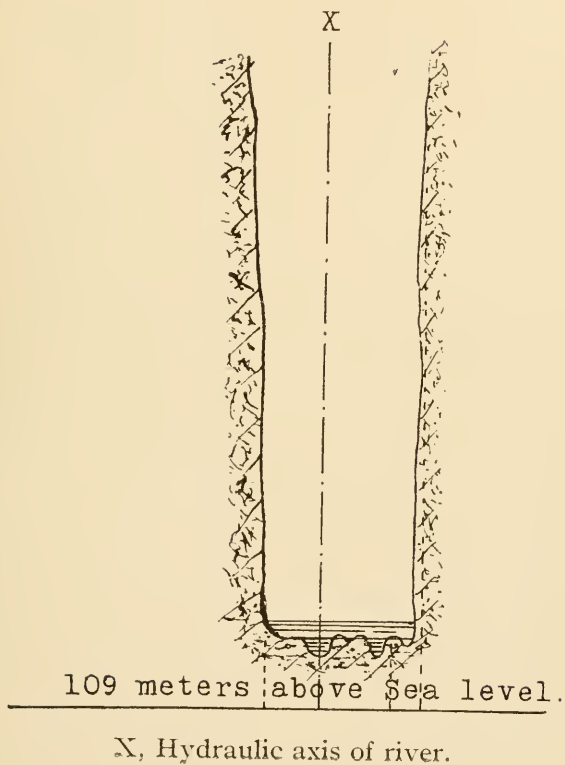
L, Point limiting valley on north side of river.

CROSS-SECTION NO. 15.
SIRUKICHA.



X, Hydraulic axis of river.

CROSS-SECTION NO. 16.
CAÑON.



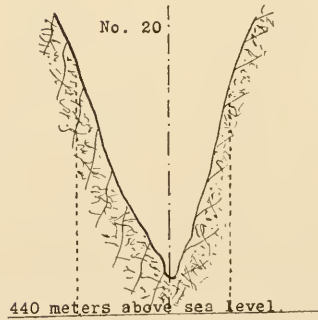
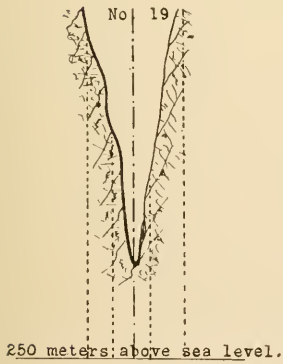
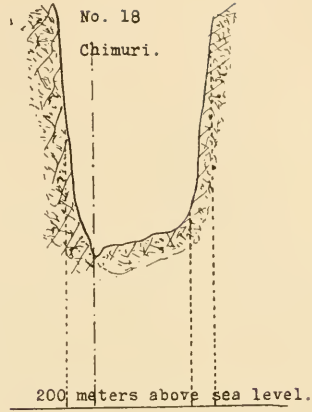
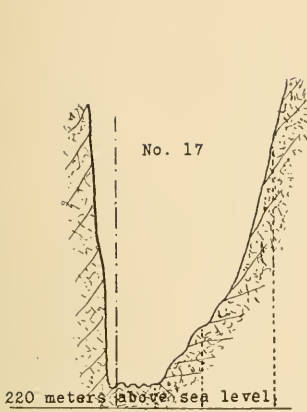
CROSS-SECTIONS.

Longitude west of Greenwich, Latitude north. All elevations above sea level, in meters.

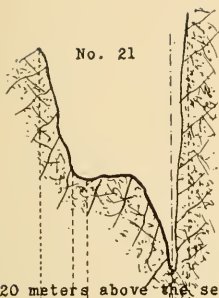
No. of section.	Geographic location.		Azi-muth.	Name of place.	River elevations.		
	Long.	Lat.			Bottom.	Low water.	High water.
17	83 05 00	9 36 15	0	.....	225	.....	.....
18	83 07 00	9 36 00	180	Chimuri.....	240	.....	.....
19	83 09 20	9 36 20	180	.....	275	.....	.....
20	83 12 30	9 37 00	180	.....	450	.....	.....
21	83 15 00	9 36 10	180	.....	630	.....	.....
22	83 20 00	9 33 50	180	.....	980	.....	.....
23	83 25 00	9 32 10	90	.....	1,390	.....	.....
24	83 25 00	9 28 50	90	.....	1,675	.....	.....

NOTE.—In all these sections the valley is restricted to the bed of the river.

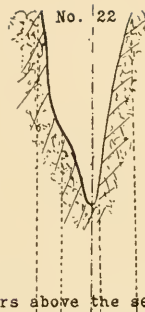
CROSS-SECTIONS.



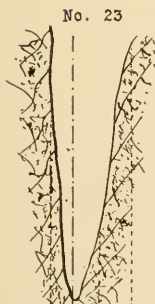
CROSS-SECTIONS.



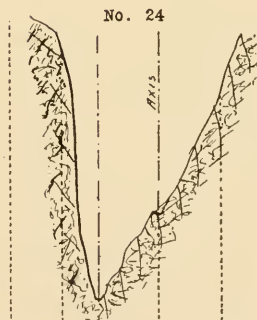
620 meters above the sea level.



950 meters above the sea level.



1380 meters above sea level.



1650 meters above sea level.

(4) THE UPPER TELIRI.

57. Returning again to the field we are obliged to occupy for the discussion of the report of the engineers, which, as we have just shown, is far from being the one that ought to furnish the ground for discussion, we come once more to the divide we followed in the detail map No. 2, sheet No. 1, which, from the point where it diverges from the other divide that we said was at the intersection of meridian $82^{\circ} 40' 47''$ west longitude and parallel $9^{\circ} 36'$ north latitude, proceeds toward the northwest in almost a straight line, until it reaches parallel $9^{\circ} 37'$, which it cuts at the meridian of $82^{\circ} 42' 52''$, and follows it to the meridian of $82^{\circ} 43'$. Thence the divide runs southernly along this meridian to the parallel of $9^{\circ} 36' 43''$, where turning toward the west it cuts the meridian of $82^{\circ} 44'$ at the intersection of the latter with parallel $9^{\circ} 36' 38''$, which it follows to regain a few seconds further on the parallel of $9^{\circ} 37'$, which it cuts at $82^{\circ} 44' 41''$ and it follows to the meridian of $82^{\circ} 45'$ at the parallel $9^{\circ} 37' 29''$, to reach Buena Vista at Station A-221. From this point the divide proceeds toward the west, some degrees to the south, until it comes to the meridian $82^{\circ} 47'$ at parallel $9^{\circ} 37' 05''$, where it confronts the course of the River Sixaola, at Sánchez Station, where the central office of the Engineer Corps was located.

58. It will be noted that throughout the whole of the section thus far transverse of the divide there appear, flowing toward the south, many brooks, creeks and little streams that are left without names upon the maps, although they are well known and may be found with their proper names on maps perhaps not so correct but yet more descriptive than those of the Commission.

59. In the supplemental plan hereto appended, based

upon the originals of the Commission, after having prepared the cross-sections, the limits of the valley have been determined and the line delineated.

60. From the Sánchez Station, where the divide is found very close to the River Sixaola, the line proceeds toward the west, some degrees to the north, until it reaches Cuabre at meridian $82^{\circ} 48'$ and parallel $9^{\circ} 37' 30''$, where it is also very near the river. From Cuabre the divide runs on toward the northwest to parallel $9^{\circ} 39' 28''$, at Station B-154, at an elevation of 300 meters. From this point, B-154, the divide follows a westerly direction, practically parallel to the course of the river and so continues to meridian $82^{\circ} 54'$ and parallel $9^{\circ} 39' 48''$, confining between the divide and the river the course of the little stream of Watzi, a tributary of the Sixaola on the left.

61. Admitting that the divide delineated may really be the crest that bounds the watershed upon the north of the Sixaola, it is impossible to consider either the Watzi Valley or the other small valleys of the tributaries as the valley of the Sixaola; but neither as forming part of this valley, because they are essentially distinct and because these lands are never inundated by the big river, as shown by the elevations of that cordillera indicated upon the map of the Commission, at the foot of which the Sixaola flows.

62. From the point stated, the divide proceeds toward the northwest, until it reaches its maximum at parallel $9^{\circ} 40' 46''$ and meridian $82^{\circ} 55' 38''$, at an elevation of 470 meters. Thence the divide proceeds rapidly toward the south to seek the sources of the Shirolí at Station B-700 shown upon the map, at an elevation of 471 meters. From this station the divide continues toward the west to

meridian $82^{\circ} 59' 40''$ and parallel $9^{\circ} 37' 22''$, almost at the edge of the map.

63. But during this entire course, by looking at the map it can be seen that high and craggy cordilleras border at times the margin of the Telire, and, as has been explained, these cordilleras are bounding the valley of the Telire and not the divide, properly speaking. The foot of these cordilleras is the limit of the valley. Here ends also the map we have been examining, "Map No. 2; Sheet No. 1."

64. The map that continues the tracing of the divide is "Map No. 1; Sheet No. 1," upon a scale of 1 : 40,000. Here we note that the divide proceeds toward the west, some degrees to the north, thus separating the basins of the River Telire and the River Estrella, and running in front of Suretka and Sirúkicha, parallel to the course of the Telire, to meridian $83^{\circ} 10'$ and parallel $9^{\circ} 38' 40''$, where it is near the apex of the "Cerro Doble." Thence the divide continues toward the west and reaches the meridian of $83^{\circ} 20'$ at Station 66-A and parallel $9^{\circ} 40'$, from whence it goes southward and reaches the elevation of 3,837 meters at Chirripó Grande, at meridian $83^{\circ} 29' 38''$ west and $9^{\circ} 29' 28''$ north latitude. Just at this point the divide ceases to be the boundary of the Telire basin upon the north and from this point, according to the statement of the Commission itself, that divide is *uncertain* in its continuation toward Durika.

65. The plan that shows the line that separates the valleys of the Sixaola and Telire upon the north has been traced, then, according to the explanations here set forth, to its extremity; that is to say, to the height in front of Chirripó Grande at parallel $9^{\circ} 35' 50''$ and meridian $83^{\circ} 03' 30''$

66. The purpose of the long description given above was to carry the delineated divide as far as Chirripó Grande.

67. The Commission of Engineers was justified in declaring the divide beyond that point as uncertain. Indeed, from the heights of Chirripó toward the headwaters of the Teliri extends a very wide and rough country and at some distances apart from each other, various low ridges emerge that afterward become the watersheds of rivers.

It is very difficult to distinguish between the streams that flow into the Upper Teliri and those that run into the other rivers.¹

68. The "divide" that has been described, therefore, is one line among many others that could be drawn cutting numerous mountain chains that seem to run towards the Telire, in a direction parallel to the Great Cordillera that separates the waters of the two oceans.

69. The most eloquent demonstration of this basic fact was submitted by the commission in the album of photographs taken from different points of view, especially in photograph No. 125, and the copy upon tracing cloth, entitled: "View from D-82." The Station D-82 was located at the intersection of meridian $83^{\circ} 06' 30''$ and parallel $9^{\circ} 37' 50''$.

70. The photographs show that there is not only one parallel chain, but several, and the high ranges that bound the course of the Telire River, which are indicated and laid down upon the maps, are, as well as the photographs, the most conclusive word that could be spoken.

71. But the Telire Valley does not penetrate so far. Practically, as the maps show, from Sirúkicha the river loses its valley and the latter becomes a cañon. High

¹See the explanation of this idea in Chapter IV, Answer to Question 1, paragraph 3, of this paper.

mountains wall in the course of the Telire, and a little further on, several tributaries, with different names come down hemmed in likewise in deep gulches or cañons, to form the "Teliri." Sirúkicha is located at the intersection of meridian $83^{\circ} 03' 20''$ west with parallel $9^{\circ} 35' 45''$ north latitude.

This geographic characteristic feature has always marked the proper distinction between the two rivers, the Sixaola and the Telire. The Sixaola has a valley whereas the Telire does not.

According to the maps of the Commission and Plate No. II of this Report, the valley of the Telire ends at Piedra Grande, where it is restricted by dikes. From Piedra Grande to Sirukicha there is a narrow strip of land called the Telire Valley.

The Indians and the people of the place give the name of Tarire, Telire or Telidi to one of the tributaries of the Sixaola, not certainly the main, which discharges its water near Suretka.

CHAPTER III.

SOME EXPLANATIONS AS TO THE TRACING OF THE LINE THAT CLOSES THE VALLEY OF THE SIXAOLA UPON THE NORTH.

1. In the preceding chapter the method adopted for tracing this line was indicated, in accord with the data furnished by the maps and profiles the Commission submitted.

2. The scale for horizontal distances is the same as that of the maps, 1 : 40,000; but it was found necessary to enlarge the scale for the elevations to 1 : 100, for the purpose of exhibiting more clearly the cross-sections.

3. The character of the ground at each cross-section is indicated by the same colors as those used upon the geological map of the Commission, so that it was needless to repeat the legend as to their signification.

4. Where no color appears upon a cross-section, it is because upon the map nothing was specified by the geologist.

5. These explanations having been made, it is proper to state here an important justification for the tracing that is presented, based upon the same data furnished by the Report of the Commission.

6. Concisely stated the argument is as follows: What is the valley of the River Sixaola upon the north side, and how far does it extend? By what documents is the tracing that is now presented supported?

7. In two separate inquiries as to the precise and correct interpretation of the terms, "valleys" and "basins," one prepared by the Professor of Geology from Lehigh University, South Bethlehem, Pa., and the other by the

author of this report, the condensed opinion of the highest authorities is given as to the strict technical application of these words, "valleys" and "basins," and those papers complete this study. But they will be disregarded, for the moment, so as to locate the tracing by taking only the same interpretation as the engineers of the Commission gave to these terms.

8. It is very certain that the Geologist of the Commission stated his own opinions in this respect in his report, where he says among other things:

"In prehistoric times, then, practically all of the creeks including Gadokan and those northeast of it, which now flow into the ocean, were tributaries of the Sixaola River; so that within a few hundred or some thousands of years the old natural drainage basin of the Sixaola on the northwest side of the river, below La Caña Creek, has been modified by losing some of its tributaries. This introduces a sharp distinction between the Sixaola Valley proper and the present Sixaola drainage area." (Report of the Geologist, p. 24.)

9. Before citing other paragraphs from this document, it will be well to briefly consider the foregoing on account of its fundamental importance in this controversy.

10. It is very evident that the paragraph contains two things. The first is the hypothesis formulated by the Geologist in the statement that some thousands of years ago the basin of the Sixaola embraced the basin of the rivers that now discharge their waters directly into the ocean. The second is a fact: that is to say, that in the *present epoch*, the basin of the Sixaola is limited and differs in its character from the basins of the other rivers that now discharge their waters into the ocean. The dilemma can be very easily solved by electing between the *hypothesis* and the *fact*.

11. This fundamental *fact*, clearly brought out by the very author who undertakes to deprive it of effect, is the best proof that we adduce to establish once for all that *the basin of the Sixaola is foreign, in the present epoch, to the basins of the Gadokan and the other rivers that discharge their waters directly into the ocean to the west of the Sixaola.*

12. The Geologist corroborates the fact that he brings out when he says:

“The present Sixaola drainage, comparatively recently modified, geologically speaking, as it has been, is but a detail of the large unit.” (Report of the Geologist, p. 25).

13. While not deeming it needful to question the hypothesis, at least, of the Geologist, we take what he states to be an actual and *present fact*, that the Sixaola Valley at the present day is but a detail of what it formerly was.

14. Agreeing with the Geologist, the Commission recognized that a kilometer below Piedra Grande a dike of biotite-basalt-porphyry was thrown out toward the river from the opposite side,¹ and as he literally states:

15. “The Sixaola Valley here has been restricted by these difficultly erodable rocks. Just below here it widens out into what may be called the lower Sixaola Valley, and above here into the wide, flat upper Sixaola or Talamanca Valley.”²

16. The author here could not have been more explicit or clear. He had before him his own map which he submits, from which it appears that the point he refers to, situated a kilometer below Piedra Grande, is distant 6,667

¹Report of the Geologist, p. 30.

²Report of the Geologist, p. 31.

meters to the south of the divide we have just defined as the limit of the valley, and at this point he declares: "The Sixaola Valley here has been restricted by these difficultly erodable rocks." Still fearing that he had not made his idea sufficiently clear and precise, he undertook to get at the reason for the restriction of the valley at this point, and added: "Now, this restriction of the Sixaola Valley could only be caused by * * *"¹ And he went on to say, further: "The chief factor in the restriction of the valley here, then, is undoubtedly * * *."²

17. There was, then, no *lapsus calami* in the statement of the Geologist that "the Sixaola Valley here has been restricted," because he immediately afterward twice confirms it by pointing out the causes for such restriction.

18. The effect of this was to put the Geologist of the Commission in harmony with it and with all of the highest authorities in the matter, as regards the precise and correct definition of a "valley," which is entirely distinct from the "basin" that is bounded by the divide.

19. Starting then from this categorical basis, going down the Sixaola Valley it widened out, as the Commission indicated by the absence of level-curves, and more explicitly when it said:

"In practically every case the flat ground extending toward the Sixaola River from the lowest contour shown on the map is marshy."³

20. As may be seen by the map submitted, these details have been minutely followed in its preparation and espe-

¹Report of the Geologist, p. 31.

²Report of the Geologist, p. 31.

³Report of the Commission, p. 29.

cially in tracing the line that separates or limits the valley of the river upon the north.

21. The cross-section No. 9-A shows very clearly the restriction referred to in the Geologist's Report. The rest of the cross-sections farther down stream, as well as those traced up stream, show the point limiting the valley that edges the left bank of the Sixaola upon its north side.

22. Even at Zavala Landing, according to what is submitted by the Commission, there is no divide visible, and down stream to the coast no level-contours appear.

23. In conformity with this description the first cross-section was drawn at Zavala Landing and at this very point is where *the line begins* that separates or limits the Valley of the Sixaola upon the north.

24. In the same way, going up stream from cross-section No 9-A at Piedra Grande, other cross-sections were drawn, No. 9-B, No. 9-C and No. 10, and thence on to No. 15 at Sirúkicha, where the narrowing valley closed in and came to an end, the cañon of the river continuing in that form onward to its headwaters. That is the reason that justifies the termination of the line limiting upon the north the valleys of the Sixaola and Telire rivers, as may be seen upon the map, at the place named Sirúkicha, indicated.

25. This demonstrates, therefore, to satiety, the origin and the reason for the line which has been traced upon the maps of the Commission and based upon its own ideas.

26. There would scarcely remain the least doubt in respect to the valleys of the tributaries upon the left side of said rivers, but for the difference made by the Commission between the valleys of the tributaries of the rivers and that of the rivers themselves. Among other citations that might be made from its report, it is sufficient to quote the fundamental one:

"The headwaters of these streams are between the various branches of the lower or ocean end of the ridges or series of ridges, just as various tributaries of the Sixaola have their headwaters between the other branches on the same side of the upper portion of the same ridge or series of ridges. Broadly speaking, the small areas drained by these streams would in general be understood as included when speaking of the valley of the Sixaola, although technically they are independent valleys."¹

27. So fundamental an assertion, which is moreover in accord with the opinions of the most eminent authorities upon the subject, is the one which has been followed so as not to include in the Sixaola and Telire Valleys the small valleys of the tributaries upon the north of that river.

28. That the Commission was in accord with what the Geologist laid down as the "Valley of the Sixaola," and has just been stated, is not only confirmed by the fact that it adopted his report, but also that in referring to the order in which the work was carried on, it said:

"In the interval from June 2 to September 16, Party C extended a continuous triangulation * * * and secured measured directions and vertical angles to many peaks on the main cordillera from Pico Blanco to Durika, inclusive, and to many other summits, especially on the slopes toward the Talamanca Valley."²

29. Party C was engaged in the reconnaissance of the cordillera and from thence fixed points upon the slopes that led to the valley of Talamanca, from which it may

¹Report of the Commission, pp. 50, 51.

²Report of the Commission, pp. 37, 38.

be inferred that the Commission considered these slopes also as forming the basin, but not the valley of Talamanca.

30. The map to which this chapter relates is thus left firmly established in all its parts.

The whole "North Divide of the drainage area of the River Sixaola," as has been plotted from the maps of the Commission, is the North Divide of the drainage areas of the rivers Sixaola and Telire or Teliri, because from the mouth of the Yorkin the River is always called Telire or Teliri River.

CHAPTER IV.

ANSWERS

TO THE QUESTIONS PROPOSED BY COSTA RICA AND PANAMA TO THE COMMISSION OF ENGINEERS

IN THE ORDER IN WHICH THE COMMISSION SUBMITTED
THEM FOR THE EXAMINATION OF THE ASSISTANT-
ENGINEERS IN THE FIELD.

I.

(1) Is it a fact, or not, that all the detached buttresses or spurs of the Cordilleras to the left of the River Tarire, up-stream from the face of the mouth of the Yorquín, have their axes in a Northwest direction and approximate courses; and that they form the divisions of the waters of the various tributaries of the River Tarire on said left bank, which tributaries, by reason of the depths of their valleys transverse to the Tarire, prevent the existence of a continuous chain of elevations having the character of a spur and fulfilling the two conditions of

(a) Uniting the extreme of Punta Mona with the Main Cordillera that divides the waters that flow to one ocean and to the other; and

(b) Closing on the north the valley of the River Sixaola or Tarire.

ANSWER.

1. Yes, it is a fact; the maps and reports are in accordance with the text of this question.

2. The summary of the documents shows that no continuous chain of elevations exists, having the character of a ridge or spur, starting from the cordillera that separates the waters of the two oceans and ending at Punta Mona.

The low ridges that border the sources of the Teliri upon the north, do not start from any point on the Main Cordillera¹.

3. The point marked by the Commission as the junction of the *divide* limiting upon the north the Sixaola Basin with the Main Cordillera (Chirripó Grande), at the intersection of parallel $9^{\circ} 29' 28''$ north latitude and the meridian of $83^{\circ} 29' 38''$ west of Greenwich² is arbitrary, because the same map and the report³ indicate the Main Cordillera as uncertain from the point marked to the intersection of meridian $83^{\circ} 30' 00''$ and parallel $9^{\circ} 27' 30''$, with an elevation similar to that of Chirripó Grande. Between these limits, the distance of which is 3,735 meters, there are not only one but many points from which divides originate for a multitude of rivulets, symmetrical in their situation and parallels, that further on form the cañon of the Upper Teliri.

To make this topography clear, extend the right hand upon a flat surface. The little finger will represent the Main Cordillera, the thumb will indicate the initial depressions of the springs that go to form later the Upper Teliri and the forefinger will represent the peak of Chirripó Grande. The back of the hand between the little finger and the thumb will represent the high plateau to which reference was made in chapter II, paragraph 67.

¹Photograph Album of the Commission; Photograph No. 125.

²Report of the Commission, p. 59.

³*Idem*, p. 57.

4. Those divides of the rivulets pointed out first form the steep bluffs that constitute the continuous cañon of the River Teliri, from its sources to Sirúkicha.¹

5. At Station A-221, located at Buena Vista, according to the maps and *Report* of the Commission (p. 30), the *divide* cannot follow the line that is marked from there. It only requires an examination of the map to see that the divide must proceed from thence toward the north by greater and more regular elevations than those it was obliged to follow. That tracing, contrary to the natural topography revealed by those very maps, is at variance with the very data upon which it is based.²

6. According to the contour levels shown upon those maps, the divide ought to proceed from said Station A-221 toward the north.

7. From Station A-221 a secondary branch starts, which proceeds almost parallel to the Sixaola, and from which, in its turn, two other small inferior branches are diverted toward the south; the one that runs to its end between Middle Creek and Gadokan, and the one that lies between Gadokan and the Sixaola,³ which are permanent and are only submerged during brief periods of high water in the rivers and near their outlet.³

¹Appendix No. 3; Report of Mr. E. R. Martin, p. 14.

²Map of the Commission No. 2, Sheet No. 1, and Report of the Commission, p. 30.

³Legend on map of Commission No. 2, Sheet No. 1.

8. In an arbitrary and hypothetical way a divide was delineated from the point at $82^{\circ} 40' 46''$ west of Greenwich and $9^{\circ} 36'$ north latitude, situated upon that secondary branch referred to in the preceding paragraph (No. 7), so as to run it across by a capricious zigzag and upon a purely imaginary line and make it terminate at Punta Mona.¹

9. This divide, as has been described in the foregoing section, never closes the northern limit of the basin of the Sixaola; but, as stated by the Commission, the whole north divide is not always and perhaps only at times the north limit of the drainage area of the Sixaola and Telire rivers.²

10. Punta Mona is completely isolated from the other solid ground by Swamp A, shown by the maps, which extends beyond Manzanillo as far as Grape Point.³

11. The valleys of the tributaries of the Sixaola are, technically speaking, "independent valleys."⁴

II.

(2) Is it a fact, or not, that the geological character of the Main Cordillera, dividing the waters of the two oceans, is eruptive and is particularly characterized by crystalline rocks; that its buttresses and spurs have the same nature; and that said buttresses and spurs, upon the left bank of the Sixaola, come to an end before they reach the front of the outlet of the River Yorquin into the Sixaola, to which and even above such outlet the deltic formation of

¹Map of Commission No. 2, Sheet No. 2; Report of Commission, p. 55.

²Report of Commission, p. 5.

³*Idem*, p. 30.

⁴*Idem*, p. 51.

the said Sixaola extends, as before indicated, level and subject to overflow?

ANSWER.

1. The report of the Geologist, agreeing with Gabb,¹ answers this question affirmatively.

2. The Main Cordillera is made up of eruptive rocks, lavas, etc.,² "acid type," that is, crystalline rocks, and its offshoots are of the same character, like the great dike of Piedra Grande.³

3. The same Geologist also says that the Main Cordillera and its immediate spurs are a much older formation than the lands near the coast.⁴

4. The rocks called by the Geologist "Basics," and which in petrography or the science of the constitution of rocks are synonymous with crystalline rocks,⁵ terminate at Piedra Grande, in the same *massif* (solid mass) that appears at the mouth of the Yorkin.⁶

III.

(3) Ascertain and report whether there is a central chain of mountains, ridge or main divide between the waters that run into the Pacific and those that run into the Atlantic Ocean.

If there is any such divide, we will, for convenience, call it by the letter "M."

¹Report of Geologist, pp. 11, 12.

²Doctor Karsten, 1886, confirms these opinions (Libr. of Congress).

³Report of Geologist, pp. 11, 12.

⁴"Bedded variety from Cuabre to Punta Mona." Report of Geologist, p. 30.

Supplemental report by Commissioner Hodgdon, p. 12.

⁵English Dict., by Isaac Funk. Edition, 1906.

⁶Geological map of Commission.

ANSWER.

1. It is evident that a mountain chain does exist that separates the waters of the two oceans; but it has not been fully localized, especially in the most important section, of 45 kilometers, from *Dome* to the peak marked "Possibly Cerro Pando."¹

IV.

(4) Ascertain and report whether there is a branch, secondary divide or counterfort of the central chain or main divide "M," running from "M" toward Punta Mona and ending at or near said Punta Mona.

If any such branch, secondary divide or counterfort exists, we will, for convenience, call it by the letter "C;" and the point of intersection of "M" and "C" we will, for convenience, designate by the letter "I."

ANSWER.

1. This question has been answered negatively in every particular, in the paragraphs comprising the answer to the first question, based upon the same citations there made from the report and maps of the Commission.

2. It is not enough that a line be marked upon a map; it is necessary and indeed indispensable that the line that is delineated be justified, meeting each and every one of the conditions it ought to have.

3. In geometry, for example, all the elements of the equation $x^2 + y^2 = r^2$ represent a circumference, and any element that does not satisfy that equation cannot form a part of the circumference in question.

4. So, in the present case under discussion, the line asked for in the question is a crest, summit or *divide* line,

¹Report of Commission, pp. 57, 58. Legend on map, No. 4.

which, diverging from the Main Cordillera, runs continuously and uniformly until it ends at Punta Mona, and moreover it must close upon the north the basin of the Sixaola.

5. The report and maps of the Commission show that the line therein described does not meet the conditions that have been stated. That line is marked, moreover, with different signs during its course, indicating a lack of unity and a different character between one section and another,¹ and even going so far as to admit, with the purpose of terminating at Punta Mona:

- (1) An imaginary course,²
- (2) An approximate course,³
- (3) Another uncertain course,⁴ and lastly
- (4) Two arbitrary courses.⁵

6. Not only did the Commission begin the line at a point more or less questionable, on account of the uncertainty that it confesses itself does exist⁶ in the section between Chirripó Grande and Durika;⁷ not only did it interpolate a course that it termed "approximate" and another course of nineteen kilometers that is deemed "uncertain;" but in order to force the line and make it end at Punta Mona it was also compelled, and this against the very data that it set forth and by which alone the act could be justified, to cut low elevations and follow secondary depressions.

¹Legend on the Commission maps.

²Report of the Commission, p. 55.

³"From the Coast to a point at latitude $9^{\circ} 33'.9$ and longitude $82^{\circ} 39'.3$." Report of the Commission, pp. 53, 54.

⁴"With the exception of the short gap of 19 kilometers between D-629 and A-2511." Report of the Commission, pp. 54, 57.

⁵See paragraphs 3 and 7 of answer to first question and level curves on the maps clearly showing such arbitrary character.

⁶Report of the Commission, p. 57.

⁷Chirripó Grande is the starting point, according to the maps.

This was done, as we observe, from Buena Vista, at Station A-221, and further on at the point $82^{\circ} 40' 5''$ west of Greenwich and $9^{\circ} 36' 00''$, where arbitrarily, without being justified by any document, two tracings were made for the purpose of continuing *the desired divide line*;¹ and yet notwithstanding all these irregularities, any one of which would be enough of itself to destroy the concept of a continuous *contrefort* (spur) between Punta Mona and the cordillera, it was not possible to make it end at the terminus desired, except by means of an arbitrary and hypothetical line, imaginary and invisible!

V.

(5) Ascertain and report the approximate latitude and longitude of the point "I," at which the divide "C" intersects the main divide "M;" also the approximate latitude and longitude of Pico Blanco and Cerro Pando.

ANSWER.

1. The point arbitrarily designated by the Commission for the start of the supposed divide which should end near Grape Point, was the peak of Chirripó Grande, situated at $83^{\circ} 29' 38''$ west of Greenwich and $9^{\circ} 29' 28''$ north latitude.²

2. Pico Blanco is situated at $83^{\circ} 02' 14''$ west of Greenwich and $9^{\circ} 16' 39''$ north latitude.³

3. Cerro Pando (the peak of Pando), uncertainly located according to the statement of the Commission in its report (p. 59), is at $82^{\circ} 49'.1$ west of Greenwich and $9^{\circ} 02'.5$ north latitude.

¹Report of Engineer Smith, Appendix No. 3, p. 11.

²Report of the Commission, p. 59.

³*Idem*, p. 59.

4. Pico Blanco does not belong to the *divide* but is found upon the Atlantic slope.¹

VI.

(6) Make a general topographical survey and plan of the main divide "M" from Cerro Pando, near parallel 9° north of the equator, to the point "I" at which begins the branch, secondary divide or counterfort "C," which runs toward and ends at or near Punta Mona.

Locate the main peaks of "M" between Cerro Pando and "I."

ANSWER.

1. The line is uncertain from *Chirripó Grande* as far as *Durika*.²

2. From *Durika* to Dome it appears to be localized,³ but from Dome, the situation of which is $83^{\circ} 07' 15''$ west of Greenwich and $9^{\circ} 02' 30''$ north latitude, the line is once more uncertain, as far as the peak which the Commission refers to as "Possibly Cerro Pando," at longitude $82^{\circ} 49'.1$ and $9^{\circ} 02'.5$ north latitude,⁴ over a distance of 45 kilometers.⁵

VII.

(7) Make a topographical survey and plan of the divide "C" which limits the drainage area of the River Tarire, Teliri, Telidi or Sixaola on the northern side of this river; this survey and topographical plan to extend from the central ridge or main divide "M" down to the sea at or near Punta Mona.

¹Report of the Commission, p. 58.

²Report of the Commission, p. 57.

³Legend map no. 1, sheet No. 1; and report of the Commission, pp. 57, 58.

⁴Map No. 4.

⁵See Map No. 4.

ANSWER.

1. The Commission has traced upon the maps the line that separates, at times, not always,¹ the basin of the Sixaola and Telire from others situated to the west, but according to its own statement² between Stations D-629 and A-2511 the line is uncertain.

2. As there must necessarily be a continuous line, separating the basin of the Sixaola from the others that remain to the north and to the west, and the line the Commission has traced, as it states in its report separates its basin *sometimes, not always*, from those of the others, it is evident that the line traced upon the maps has no relation to the one that is being discussed.

3. There may be repeated here what was said in that respect in the answer to Question VI, and so far as applicable the paragraphs in the response to Question I.

VIII.

(8) Make a topographical survey and plan of the course of the River Tarire, Teriri, Telidi or Sixaola, from the main divide "M" down to its mouth on the Atlantic Ocean; and locate the points of junction of said river with its main affluents on either side of the said river Tarire, Teriri, Telidi or Sixaola.

ANSWER.

1. The maps of the Commission delineate the entire course of the Rivers Sixaola and Telire. Some tributaries appear without names, but it is easy to recognize them.

2. These tributaries or affluents have their independent valleys, according to the specific text of the report of the

¹Report of the Commission, p. 5.

²*Idem*, p. 54.

Commission,¹ and do not form a part of the Sixaola and Telire Valleys.²

3. Here, then, is the proper place to state a new phase of the whole question.

If, as claimed, both the valleys of the tributaries upon the left side of the Telire and Sixaola,³ as well as those of the rivers that empty directly into the ocean,⁴ ought to be included or incorporated in the Sixaola Valley;

If, as the Report of the Geologist says, the higher land of Punta Mona ought to be a part of the same geological unit as the Buena Vista divide,⁵ when he says:

“The Sixaola Valley proper is the large geological unit and it extends out of the Crest of the Buena Vista Divide, and to the higher land of Punta Mona.”⁶

If the whole of the basin now foreign to that of the Sixaola and Telire, which encloses the high and low lands of Gadokan, Punta Mona, Manzanillo and as far as Grape Point, because Swamp A reaches that far,⁷ must be understood as the Sixaola and Telire basin.

Then, it is clear that the real, geographical, only and unquestionable divide, and the one that accommodates itself to these strange conclusions is the one that starts from Buena Vista, at Station A-221 and runs to Cocles Point and which the Commission abandoned and disregarded in order to go back and follow, as has already been explained, in an arbitrary and contradictory way, according to the tenor of its own statement, from Buena Vista, a divide that divides the waters of the same River Sixaola.

¹Report of the Commission, pp. 50, 51.

²Archibald Geikie, p. 179, is also in accord with this principle.

³Report of the Commission, p. 50.

⁴*Idem*, p. 50, 51.

⁵Report of the Geologist, p. 22.

⁶*Idem*, p. 25.

⁷Report of the Commission, pp. 29, 30, 51, 56.

4. We are led to this inexorable conclusion by the condensation in the foregoing paragraph of the various opinions in that respect stated by the Commission.

5. And in that divide the climax is reached, making it end by an imaginary straight line across a swamp, at sea level, frequently inundated, where no divide had ever existed, nor any signs of being able to trace one, in a marsh which neither the Commission, nor its Assistant Engineers, nor even its laborers were able to cross.¹

6. It would, therefore, seem to be more logical, inasmuch as it is claimed that the basin of the Watzi forms a part of the valley of the Sixaola, that the divide should proceed closing also the north side of said Watzi Basin, and continue by the divide that terminates at the coast.

IX.

(9) Make a topographical survey and plan of the territory lying between the River Tarire, Teriri, Telidi or Sixaola and the divide "C."

It is sufficient to indicate the most important points of this territory.

ANSWER.

1. For the series of reasons stated by the Commission, already indicated, the topography of this territory remains uncertain.²

2. It would be necessary to have the data indicated by the Commission as doubtful, uncertain and approximate, given their proper value and situation for the topography requested to be correct.

¹See chapter VI.

²Report of the Commission, pp. 49, 57.

3. The data introduced of a hypothetical character would have to be excluded and those of an arbitrary nature abandoned.

X.

(10) Ascertain and report whether the valley of the Sixaola or Tarire River is closed on the north by a divide, counterfort or branch of the main divide "M."

ANSWER.

1. In conformity with the scientific definition of the word "valley," as established by the Commission,¹ " * * * ", that is to say, the topography is to indicate *the break between the hills and the plain*," the Valley of the Sixaola is not closed by the divide that encloses its basin.

2. The line that closes the Valleys of the Sixaola and Telire upon the north has been traced, using the data furnished by the maps of the Commission and its own reports in respect to the point where the valley is restricted to the very bed of the stream, as is the case at Piedra Grande.²

3. In Cuabre " * * * " a narrow strip of flat land lies between the hill and the river. " The valley is so narrow here that the Commission did not undertake to designate it by its name, but called it " * * * " a narrow strip of land."

4. The most conclusive statement in regard to the Sixaola Valley is that made by the Commission in its report (p. 52, top):

"In some places the banks are so steep that extensive slides are taking place; and in one place, south of

¹Report of the Commission, p. 28. Hodgdon report, p. 6.

²Report of the Geologist, p. 31.

Cerro Doble, it is known that such slides temporarily dam the river until the water by accumulation behind it creates sufficient power to cut its way through the slides."

XI.

(11) Ascertain and report whether said counterfort or branch of the main divide "M" has several sub-branches or spurs, running approximately from northwest to southeast; and whether one of these ends near the Sixaola River, opposite or nearly opposite the mouth of the Yurquín.

ANSWER.

1. From the ridge that borders the bed of the Sixaola upon its north side, in front of the mouth of the Yorkín, a prominent and irregular elevation extends that runs first to the north, afterward to the west and then to the north again and reaches the crest of the basin of the Sixaola.¹

XII.

(12) Is it a fact, or not, that all the territory comprised between the left bank of the mouth of the River Sixaola in the Atlantic Ocean and Punta Mona, inclusive, as well as that which extends toward the interior for many miles distance, forming part of the delta of said river, is made up of sedimentary matter carried by fluvial action, and presents a level area, low and in many places marshy?

ANSWER.

1. The maps of the Commission answer all the points in this question in the affirmative.
2. The Report of the Commission corroborates them by saying: (p. 29).

¹Report of the Commission, p. 52.

"In practically every case that flat ground extending toward the Sixaola River from the lowest contour shown on the map is marshy, except where the land is cultivated and has been drained."

3. The swamp of Punta Mona extends beyond Manzanillo, as far as Grape Point.¹

XIII.

(13) Is it a fact, or not, that the principal elevation of land existing at the said Punta Mona, washed in part by the waters of the sea, is found to be separated from the remainder of the area of said delta by a deep and permanent morass, of some miles in width, which isolates it completely from the rest of the delta mentioned?

ANSWER.

1. The maps as well as the Report of the Commission (p. 51) establish the fact that Punta Mona is separated from the rest of the mainland by the swamp of some two kilometers in width.

2. In periods of high water this swamp is inundated (*ibid*, p. 51).

XIV.

(14) Is it a fact, or not, that said small elevation of land of Punta Mona is of recent geological formation, made up of a prodigious growth of coral rock upon the banks of sand, and in turn upon this coral rock by the deposit of clay and yellow dirt which have formed the rocks that are found all along the littoral of the Sea of the Antilles, and which Professor Gabb, of Philadelphia, has designated by the special name of "*Antillita*" (Little Antilla)?

¹Report of the Commission, p. 30.

ANSWER.

1. The Geologist reports that the ground at Punta Mona is of the same character as that found upon the other side of the Swamp A.¹

2. Although the Commissioner, Mr. Hodgdon, does not describe this ground and refers to the opinion of the Geologist, it appears:

(a) That the Geologist did not visit Punta Mona personally,² because Punta Mona, according to his own map, which he presents on a scale of 1:40,000, is located at $82^{\circ} 37' 30''$ west longitude from Greenwich, and his personal investigations began at meridian $82^{\circ} 38'$ west of Greenwich, leaving the whole of the territory between the mouth of the Sixaola, $82^{\circ} 34' 50''$ west of Greenwich and half of a maritime mile farther to the west than Punta Mona outside of his personal examination; or, that is to say, a distance embraced between the meridians of $82^{\circ} 34' 50''$ and $82^{\circ} 38'$, which is equivalent to 5,852 meters; and

(b) That admitting what the Geologist says in respect to the ground of Punta Mona, the result is that from some distance above Cuabre toward the Caribbean Sea, the region is part of what was comprised in the coastal plains of the Caribbean,³ and to corroborate this, the Geologist added:

“The oceanward fringe of these coastal plains consists in many places of extensive black mud swamps and swampy coral flats.”⁴

¹Supplemental Report by Commissioner Hodgdon, p. 10.

²Report of the Geologist, p. 9, section A.

³Report of the Geologist, p. 9, section B.

⁴*Idem*, p. 9.

3. Gabb designates these lands by the name of "*Antillita*," not "Little Antilla," but as lands belonging to the whole of the coasts of the mainland, like the islands of the Sea of the Antilles.

4. The hypothesis of the Geologist in respect to the prehistoric sinking of that region cannot be a subject for consideration here in view of the facts he himself states.

XV.

(15) Is it a fact, or not, that the said elevation of Punta Mona is only connected with some hills of analogous character, parallel to the coast and which terminate in the point called Manzanillo, situated some four kilometers distant to the west of that point?

ANSWER.

1. Punta Mona, with its adjacent hills that extend to Manzanillo, all consisting of coral rock, is found to be constantly and always separated from the rest of the main land by Swamp A. There is not the slightest evidence of that locality being the end of any ridge or spur from the principal chain of mountains that divides the waters of the two oceans.

2. The hypothetical creation of an end of a spur or counterfort there, is a fiction that leads to the most extravagant conclusions.

3. The topography of the ground, at least, does not suggest it.

4. Nor does the character of the ground permit its supposition.

5. The plans and the longitudinal profile, especially, submitted by the Commission, afford the most eloquent testimony to the truth of this statement.

6. The profile shows Punta Mona as an island separated from the main land by a flat swamp, "at the sea level," as we understand, which is impassable and is inundated, the waters of the Sixaola then being confused with those of the Gadokan and the others of the basin that discharge their waters directly into the Atlantic, and those of the Gadokan with those of the Sixaola, according to the positive expression of the report.

XVI.

(16) Is it a fact, or not, that said elevation of Punta Mona and the hills that form its continuation to Manzanillo, from the materials of which it is composed, and from the absence of any mountain or cordillera from which it runs off or to which it relates, does not constitute a buttress or spur, but a series of small, isolated hills?

ANSWER.

1. Yes. The text of this question is answered in the response to the one preceding and in the others that relate to the situation and the character of the ground constituting the isolated elevations of Punta Mona and Manzanillo.

XVII.

(17) Is it a fact, or not, that said hills, all lying between Punta Mona and Manzanillo, inclusive, are, like the elevation of Punta Mona, separated from the rest of the delta of the River Sixaola by a barrier of impassable swamps, many miles in width?

ANSWER.

1. According to the maps and the Report of the Commission (p. 51), Swamp A, which separates Punta Mona and Manzanillo from the mainland, measures two kilo-

meters in its middle and average width. It extends beyond Manzanillo and reaches as far as *Punta Uva* (Grape Point). (*Idem*, p. 30.)

In times of high water this Swamp A "is flooded," and then its width extends to the last contour line indicated upon the maps). (*Idem*, p. 51.)

XVIII.

(18) Is it a fact, or not, that across the said swamps, in the interior of the delta of the Sixaola, all the elevations of land that are detached upon the left zone of that river are of recent geological sedimentary formation, of an analogous character to that of the hills of the coast, and the aforesaid elevations, from the materials of which they are composed and the lack of connection with cordilleras or mountains of which they form a continuation, cannot constitute a buttress or spur?

ANSWER.

1. The Report of the Engineer of Party A, Mr. Weakland, asserts that being located personally at Station 6, which was a point between Middle Creek and Manzanillo, all the elevations surrounding it in every direction of the compass are of coral formation.¹

2. Such ground is entirely distinct from that constituting the central mass (*massif*), which is composed of basic rocks, as the Geologist terms them; that is, having a crystalline structure.²

3. The different nature of the two grounds, which the same Geologist separates into three physiographic unities, a subdivision that is not new to one who has read the

¹Appendix No. 3, report of Mr. Weakland, p. 2.

²Report of the Geologist, pp. 11 and 12.

work entitled: "Rivers of North America," by Israel C. Russell, Professor of Geology in the University of Michigan (1898, p. 97; Chap. V; "Stream Deposits"), shows that the hills of Punta Mona bear no relation to the Main Cordillera, or to the spurs or counterforts (buttresses) attached thereto.

CHAPTER V.

THE STARTING POINT, UPON THE MAPS OF THE COMMISSION, OF THE SUPPOSED DIVIDE, MARKED WITH TWO BLACK CONTINUOUS AND PARALLEL LINES.

1. The maps and reports of the Commission have been examined very carefully and at length, in relation to the starting point of a supposed *divide*, marked by two continuous and parallel lines, designated upon the maps by the legend: "*Divide which is the north limit of the area which drains into the Atlantic further south than Punta Mona.*" This, it may be remarked in passing, as its very name indicates, has nothing to do with the question under discussion in this controversy and no sort of a basis for the tracing of any such line having been found in the maps and reports, an application was made at the office of the Commission for the field notes of Party A, and also for the map submitted by the Representative of Panama to said Commission, without any title, but bearing at the bottom a note which (translated) reads as follows:

"NOTE.—The line — — — indicates the summit of the Cordillera that runs from *Los Andes* to *Punta de Monos* or *Punta Carreta*. This ridge is the boundary between Panama and Costa Rica, according to the Award of M. Loubet.

"(Signed) ABEL BRAVO, C. E.

"Panama. December, 1910. Scale, 1 : 40,000."

The field books for this section are twenty-five in number. In the first of these, referring to the survey from Cuabre to Punta Mona, it does not appear that the

engineer made any note or marked any stake of deviation from the principal line that was run.

2. In the field book "3-A," there is found repeatedly, as may be noticed among other pages, in No. 21, the note: "*Bravo's line;*" and the divide marked in one of the sketches of the engineer indicates Station A-909 as the point of a branching off, where the divide of the basin of the Sixaola was abandoned in order to follow another and different one.

3. The result is, therefore, that in the documents submitted nothing is to be found but the note placed by the Commission upon the maps in order to designate that "divide," foreign to the subject, and among the reference papers there is no justification whatever for the starting point of that extraneous divide.

4. On the contrary, an examination of the Plate No. III, which is annexed, shows that the offshoots which were traced from the Sixaola divide and which were abandoned at Stations 793, 823, 894, 1126, 1116, 1150, 1162, 1200, 1191 and 1223, had just as good or a better right to be continued to their ending as the one that was followed from 1212, in an easterly direction, and from that same Station 1212 there was just as good or a better reason for continuing the Stations 1237 to 1239, and that of 1263, which was also abandoned at 1285 to proceed toward 1342, and from thence traverse the swamp and reach Punta Mona, but still leaving from 1342, the line which is examined, to 1690 and from thence to 1625, at the mouth of Middle Creek upon the Atlantic Ocean.

5. All these lines were abandoned in order to follow arbitrarily the offshoot which was begun from the Sixaola divide at Station 909, and which only appears upon the Bravo Map as prolonged to Punta Mona, and coincides

exactly in distance and direction with the one that the Commission adopted from among all the others.

6. In order to justify that line which was adopted, it would have been necessary to terminate those that were abandoned, and evidence it in that way.

7. But it appears that the line which was left at 1342, for the purpose of running to Punta Mona, was continued to the coast and ended at Station 1625 at the mouth of Middle Creek, the result being that the line that was adopted was by this very fact divested of any authority and left resting alone upon the line drawn by Panama.

8. It may very well be that the Commission should have had before it such Panamanian documents, in such case, however, being restricted in their use to their verification by its own investigations; but to set aside its own examinations in order to substitute therefor such one-sided data can not be admissible.

9. The minute details collected by the Commission of all that was observed in the field, as well as the office calculations, for all the sketches and pencil figures were turned in, leaves no room for doubt that all the lines cited were abandoned for the purpose of following the one marked by Panama upon its maps. This assertion is confirmed by the last paragraph, in the form of a protest, which an engineer of the Commission, Mr. Ashmead, introduced at the close of the Commission's report:

"I take exception to Appendix No. 3, in that in it is not included certain information from the Assistant Engineers which should be included therein."¹

10. But all that has been alleged is further corroborated by the fundamental declaration of the Engineer, Mr.

¹Report of the Commission, p. 65.

Ashmead, in his Supplemental Report (p. 24), where he expresses the surprise that he felt to see placed upon the final maps the line across Swamp A—

“* * * which was arbitrarily drawn on the final maps during their construction under the supervision of the Chairman of the Commission.”¹

11. Such a declaration, laid before the other three Commissioners, so fundamental in its nature both in form and substance, if it had not been well founded, would have given rise to some specific justification on the part of the other three members. No document, however, appears that questions the allegation made by Mr. Ashmead, neither does there appear to be any justification for tracing the arbitrary and hypothetical line, nor for drawing the line from the place this one begins at, but it is just *a copy of the line laid down by Panama*.

12. Now it can be stated that it was this very reason and none other that led to the tracing of the “divide” to which reference was made in the answer to “Question IV” (Chapter IV of this paper), where it was shown by data furnished by the Commission itself that such line was traced with courses that were fundamentally uncertain and imaginary.

13. For, as a matter of fact, nothing more is needed than to lay the tracing of the line by Señor Bravo, drawn to the same scale as that of the map of the Commission, over that map, in order to note the coincidence of the two lines throughout almost the whole of their extent. That is to say, a document which it is sought to have appear as an original, is really nothing more than a copy of a map furnished by one of the parties.

14. The foregoing analysis, however, seems almost need-

¹Report of the Commission, p. 53, par. 2.

less in the face of the manifest proof furnished by the Commission itself as to the fact that is alleged. In giving instructions to the Chief Engineer of Party A, it was distinctly said:

“Eastward along the River Sixaola to its mouth, securing only such detailed information as shall be necessary to check the general direction and main bends of the river as shown in existing maps.”¹

But judging by the results it would seem as if the Commission must have said: “* * * and the bends of the divide as shown upon the map of Señor Bravo.”²

The Commission stated that it had in its possession and it turned over the following maps:³

1. Map of the Atlantic Coast of Costa Rica, from Old Harbour to Almirante Bay. Scale, 1 : 40,000, in which are shown farms and railroads of the U. F. C.
2. *Mapa Geológico de Talamanca* (Geological Map of Talamanca), by Wm. M. Gabb. 1873.
3. Paper tracing: Bravo's Map of North Divide, December, 1910. Scale, 1 : 40,000.⁴
4. McCrone's Compiled Map.
5. Blueprint Map of Punta Mona, Carreta; by Matamoros. Scale, 1 : 5,000.
6. Map of Costa Rica, prepared by the International Bureau of American Republics. 1903. Scale, 1 : 792,000.
7. Tracing of Matamoros' Map, Plan of the Sixaola. Scale 1 : 40,000.
8. Petermann's Map of Costa Rica. Scale, 1 : 600,000.
9. Map of Costa Rica, by H. Pittier. 1903.

¹Report of the Commission, p. 27, par. 2.

²See Item 3 of the appended list.

³Contents of Box No. 104.

⁴The Commission here creates this title for Bravo's Map and thereby admits it to be *of the North Divide*, whereas the map shows only a line marked thus (translation): “Cordillera boundary from Punta Mona or Punta Carreta.”

There were some other blueprints and reduced tracings, but among all these enumerated in this list, the Bravo Map alone, which was the one prepared by Panama, had the supposed *divide* delineated, under the following title (translation):

“Cordillera boundary from Punta Mona or Punta Carreta.”

And at the bottom of the map it stated (translation):

“NOTE.—The line — — — indicates the summit of the Cordillera that runs from Los Andes to Punta de Monos or Punta Carreta. This ridge is the boundary between Panama and Costa Rica, according to the Award of M. Loubet.”

15. So that as to this point of vital importance, lying at the very foundation of the whole controversy in the establishment of which the Commission had no right whatever to look to the claims of either one of the parties, much less to rely upon the data presented by either of the two countries; as to this very vital point, we repeat the Commission was content and even ordered its Engineer to check only the data “*as shown in existing maps;*” and as the map of Panama was the only one that showed the hypothetical divide, thereupon it was copied in order to comply with the directions of the Commission.

16. Panama had in its possession the plans prepared by Señor Bravo under the orders of that Republic, and yet notwithstanding that fact it specifically requested that the Commission should make a topographical examination of the whole of that region. It would seem, therefore, that Panama for the moment at least disregarded its own data and sought for new information, but in spite of this the

Commission did no more than to repeat upon its plans the data furnished by Panama upon the Bravo Map.

17. It may be urged that the result that is given shows that the investigations of the Commission indicated a conformity with those that had been made by Panama. That would be quite so, provided the Commission had furnished records covering the line offered by it throughout its whole extent, but we have proved that no such records exist, and gone even so far as to show by the Commission's own report (p. 27) that it provided, to that Party particularly, to check the existing maps.

18. So, while it was discussed in the proceedings of the Commission, whether or not it was best to put into the hands of the Engineers of the different parties the questions proposed by the two countries, it was also discussed whether or not Engineers of the two countries should accompany the Commission; and as to the first point it was decided to deliver the questions proposed without any indication of their origin to the Engineers in the field; and as to the second, only to permit visits by the engineers of the two countries to the surveying camp; but why was it not also discussed whether or not the maps of the interested parties should be delivered to the field engineers? It is clear such a question would have received an absolute negative, in order to secure a more impartial judgment by the Commission, and yet while that point was not even mentioned, those maps not only were in the hands of the Commission but also and continuously in the hands of the field engineers, so as to reduce their work merely to the checking up of lines previously drawn and one-sided in the controversy.

19. The clearest evidence that the Panama map was in the hands of the Engineer, Mr. Weakland, who was at the head of Party A, is found in the correspondence of that engineer, under dates of March 10 and April 15, indicating that the dotted line,¹ having no designation whatever, ought to be filled out with the words "Bravo's Line," and "Bravo's Map," in conformity with what is shown in the original correspondence of that engineer.

In those letters are to be found the phrases that complete the mutilated paragraphs alluded to. It is not for us to pass judgment upon the motives that led the Commission to eliminate those words from the text, nor the resultant consequences if they had been included.

20. The foregoing arguments have compelled us to once more look at the various sections distinctly designated by the Commission as "arbitrary," "uncertain" and "approximate," and referred to in paragraph 5 of Chapter IV, in the answer to Question IV.

21. In order to follow the sequence in which those sections were given in the Chapter mentioned, let us begin with—

I. THE IMAGINARY COURSE.²

This begins at Punta Mona, crosses Swamp A and ascending the rise reaches the arbitrary point $9^{\circ} 36' 40''$ north latitude and $82^{\circ} 39' 00''$ longitude west of Greenwich, at an elevation of 90 meters; whence it proceeds, also arbitrarily, to Station A-1239, a point situated at a height of 193 meters.

¹See Appendix, No. 3, pp. 1 and 2.

²Report of the Commission, p. 55: " * * * if such permanent divide exists * * *."

22. This course is not a divide of the valley or of the basin of the Sixaola, and even if it were divested of its arbitrary and hypothetical character, given to it by the Commission, it could have no relation to the matter now being discussed, because it is a divide that separates the waters of a basin foreign to that of the Sixaola, as it was expressed by the Commission itself,¹ and as appears by looking at the maps upon which it is marked by two continuous black parallel and afterwards broken lines.

II. APPROXIMATE COURSE.²

23. The Commission avers that this line “* * * from the coast of a point in latitude $9^{\circ} 33'.9$ and longitude $82^{\circ} 39'.3$ * * *,”—quoting its very words in its report (p. 53)—is a part of the divide of the watershed of the Sixaola and is the terminal thereof upon the coast.³

24. It recognizes, then, that this black broken line is a *portion of the divide* that ends at the coast, but not at Punta Mona, for its own allegation, as we saw by the previous paragraph, was that the divide that ran to Punta Mona was not the divide of the Sixaola watershed.

Beside, with the purpose of justifying the fact that the examination of this portion of the divide of the Sixaola was only an approximate one, it made its own the language used by the Engineer of Party A, who said:

“Please note that the Gadokan Creek was not run out entirely to its mouth. Water was very high at the time this survey was made and this creek empties into a lagoon before entering the sea, so it was impracticable to follow it the entire distance. How-

¹Report of the Commission, p. 55, par. 2.

²Report of the Commission, pp. 53, 54.

³Report of the Commission; bottom of p. 53.

ever, I walked over the ground between the Creek (Gadokan) and the Sixaola and satisfied myself that there is no connection between them.¹

25. In accordance with what the Geologist laid down,² if we take the average of careful observations covering a period of six consecutive years, from 1906 to 1911, it would appear that the amount of rainfall in that section (certainly one of the nearest to the meteorological observation station) toward the end of June, corresponded to the general average for the months of June and July, or say 11.42 inches, and this figure is very close to the highest monthly average for the six years taken.

26. The Commission, therefore, had in its possession arguments that could not be gainsaid for not putting in doubt the real existence of that divide and showing that there was no basis for the hypothesis that it was at times submerged, for the surveys were carried out in the end of June, and that was the time of high water in that locality; and so if, under those conditions, the Engineer certified that no connection existed between the course of the Gadokan and that of the Sixaola, what reason was there for asserting that in times of flood the courses of the two streams were confused?

27. The eloquence of these numeric facts destroys the hypothesis and proves:

A.

28. That the real divide does exist, marked by the Commission upon its plans, from the coast to the point at $9^{\circ} 33' 9''$ and $82^{\circ} 39' 3''$. Its starting point at the coast was situated at $9^{\circ} 35'$ north latitude and $82^{\circ} 34' 38''$

¹See end of letter dated June 22, 1912; Appendix No. 3, p. 3.

²Report of Geologist, p. 14.

west longitude from Greenwich, according to Map No. 1, Sheet No. 1, by the Commission.

B.

That this portion of the divide, indicated upon the maps as a broken line was traversed by the Engineer of Party A, who certified that at no point did the waters of the Sixaola have any connection with those of the Gadokan.

C.

That this examination was made during the period of high water in the streams and, therefore, is known approximately only.¹

D.

That in view of the evidence furnished by the Geologist in his report (p. 14), the fact is well settled that such investigation was carried out when there was a maximum precipitation in that locality, and consequently there is no reason to suppose that this divide was inundated at other times.²

III. UNCERTAIN COURSE.³

29. This uncertain course of the divide, according to the very words of the Commission itself, “* * * between D-629 and A-43 * * *,”⁴ was laid down by means of

¹Report of the Commission, p. 54; 1st and 2d lines from the top.

²See analytical demonstration of this fact, Chap. VI, par. 10,

³Report of the Commission, pp. 54 and 57.

⁴Report of the Commission, p. 41.

"* * * distances *determined by the time* that elapsed in traversing them, directions by the compass and elevations indicated by aneroid barometers;" and although the report excepts from these conditions "* * * a short gap of 19 kilometers * * *" (p. 54), according to what the same report states at another place (p. 41), that "short gap" starts at the peak A-43, which was fixed, not by topographical means (a traverse line adopted), but by trigonometrical processes "* * * by intersections from Party A's traverse line, a distance of about 18 kilometers."¹

30. By looking at "Party A's traverse line" any one can see that a worse disposition could hardly have been made in seeking to find by means of an intersection the location of peak 43-A. It is well known that if locations obtained by the use of the intersection method are to be relied upon there must be, in the first place an extended base, accurately measured, and in the second place, the extremes of the base joined to the point that is to be fixed should form as nearly as possible an equilateral triangle.

31. In the present case none of these conditions were satisfied, for "traverse line A," from where it would have been possible to make the most extended observation of the peak 43-A, did not measure more than 5,700 meters between the Stations A-2400 and A-2511. The maximum base, therefore, was very short and the maximum angle of the apex which the observer could have obtained did not reach 17°; that is to say, half of that required by trigonometry for a proper operation. Assuming the base of 5,700 meters to be correct, the error in the short distance from A-2511 to A-43 would

¹Report of the Commission, p. 41.

reach, in case there was a variation of a minute more or less, some 554 meters, as laid down by the Commission.¹ If this was the only ground for uncertainty, the Commission admits it; but it further appears that from A-43, left thus uncertainly located, it continued as we have indicated over a length of 19 kilometers as far as Station D-629, and taking into consideration the difficulties met with in traversing those mountains, it is very evident that the course embraced between A-43 and D-629 was in every way uncertain.²

IV. ARBITRARY COURSE.

32. We have seen (paragraph 3 of Answer to Question I, Chapter IV) that the starting point of the divide at Chirripó Grande was chosen arbitrarily; and likewise arbitrary was the selection of the point at Buena Vista for the divide to turn off in a different direction from that indicated by the topography of the locality. For such deviation there was no other reason than the one pointed out in the beginning of this argument for the hypothetical and arbitrary course, as the Commission itself so designates it.

33. The Panama map agrees with the *original of the Commission* in the location, distance and direction of the course marked by the two continuous and parallel lines, from the point of departure to Station A-1239, where it follows the hypothetical course of the Commission.

¹Report of the Commission, end of p. 54.

²To be sure of this irregularity, let us look at the original paper No. A-25, and the distance for the determination of the location of the peak A-43 is found to have only been 1065.9 meters. See Triang. Sheet No. 22. Consequently the approximation is still less than the base of 5,700 meters would give.

34. In proof of all that has been stated, reference is made to the accompanying map, Plate No. V, submitted by the Republic of Panama, signed by its Engineer, Don Abel Bravo, and to the tracings, Plate No. IV, that make apparent the similarity of the line of the Commission and of the Panama map at the point $9^{\circ} 36' 00''$ north latitude, and $82^{\circ} 40' 46''$ longitude west of Greenwich, which led to this examination.

35. Aside from all this, the reason is not evident for the marked and decided effort shown by the Commission in all the minor details of its examinations and reports to establish the *divide* of the Sixaola basin upon the north side, to the extreme that one of the engineers in the field referred to it as the "*divide desired*,"¹ That line, without any doubt, did constitute one of the elements in the problem that was submitted, but it was no more than a simple *datum* and not as *the object*.

36. The French Arbitral Award, which the Commission had in its possession, had nothing whatever to say about any such divide; but it referred to the line that closed upon the north the *valley* of the Sixaola, not the line that closed upon the north the *basin* of the Sixaola.

37. The Engineers of the Commission defined the valley of the Sixaola very well when they marked it as restricted by high rocks and confined to the course of the river.

38. They should have adhered to this view at all times and when they had once found the divide, continued to use it as a means for determining the line of the *valley*, that being the object of their mission.

¹F. Smith, Appendix No. 3, p. 11.

39. In no part of the report or upon the maps was that line treated, but only the divide, although they are entirely distinct.

40. That is the reason why the line, to which we refer, has been traced, supported by the reports and maps of the Commission.

CHAPTER VI.

BASES OF SOME POINTS DISCUSSED IN THE PRECEDING CHAPTER.

1. The foregoing examination seems to pass rather hastily over the points that were brought out therein, although the maps and reports of the Commission—in the form they have been submitted—afford no room for doubt as to the veracity of our statements. It is evident that such maps were prepared, not only with the data obtained upon the ground, but also by the use of existing maps, like that of the coast between the mouth of the Sixaola and Punta Mona and others that will be cited.

The present chapter has been written to substantiate still further the various parts of that examination.

2. This seems to be the proper place to show that the plans of the Commission were not justified by themselves, nor by the report that accompanied them. Both of the parties to the controversy had in their possession maps of this region, and among others, the map of Wm. Gabb (1877-1878), prepared upon the order and for the account of the Government of Costa Rica, upon which all the others that have been made since were based. But what was needed was not maps, according to the literal text of the petitions of the two parties, but it was plans with the proper accompanying documents to show the lines which were run and examined ("Traverse Lines"), as provided in Paragraph (c), page 13 of the Report of the Commission, and as is customary in all topographical maps.

3. If these conditions were to have been put into practice it is evident that the phrase to be found in the

Commission's Report (p. 27): "*A continuous survey from Cuabre to Punta Mona was completed on April 26,*" was not correct, because from the very moment that the portion of the coast lying between the mouth of the Sixaola and Punta Mona was taken from the "*Hydrographic Office Chart, No. 945,*"¹ and used in order to connect the Punta Mona section with the territory separated from it by Swamp A, there was no "continuous survey" made.

4. What the Commission termed a "*continuous survey from Cuabre to Punta Mona,*" was the one it showed upon its maps; that is to say, the course marked by a black cursive line, which continued, marked by two black parallel and continuous lines, and the one that at the end of the latter proceeded by two parallel broken lines and terminated at Punta Mona. Our argument goes no further than to prove that such line was not a "continuous" one.

5. Without prejudice to the analysis that follows for the purpose of establishing the foregoing proposition, it will be stated that from Station A-1625 (Mouth of Middle Creek), Party A ran a "traverse line" which localized the course of 1,300 meters as far as Station A-1686, which does not appear to be drawn upon the map, but which began at a point situated at $82^{\circ} 37' 38''$ west longitude and $9^{\circ} 36' 32''$ north latitude. This belongs in Map No. 2, Sheet No. 1, exactly where a black dot is placed over the letter "r" in the word "Trail," west of a bend in Middle Creek; and from this point A-1686 the survey continued along the ramification whence the "arbitrary and hypothetical divide" was taken off.

6. Let us look at the fundamental facts.

Party A followed the course that started at Station A-1239, in an easterly direction, some degrees southerly,

¹See map No. 2, sheet No. 1.

and which continued along the summits indicated by the natural topography of the ground and the elevations of which are recorded as follows:

Station A-1239, notebook No. 3-A.

Station A-1283 to A-1263, pp. 145 to 151.

and for the continuation of the line:

No. 5-A, from A-1621 to A-1644, pp. 43 to 51.

No. 4-A, from A-1645 to A-1675, pp. 147 to 157.

No. 6-A, from A-1675 to A-1679, p. 21.

No. 6-A, from A-1679 to A-1719, pp. 23 to 35.

There was included in these, the Station A-1626, close to the mouth of Middle Creek where it enters the ocean. At the foot of page 46, in notebook 5-A, is found Station A-1625, and a shot to the mouth of the river, with this note: "Mouth of Middle Creek." The elevation of A-1626 is 4.4 meters, as appears upon the same page.

On page 47 we find—

Station A-1626 with an elevation of 4.4 meters.

"	A-1627	"	"	"	"	3.5	"
"	A-1628	"	"	"	"	3.5	"
"	A-1629	"	"	"	"	5.8	"

On page 53 of the same notebook, 5-A, we find—

Station A-1679 with an elevation of 5.4 meters.

"	A-1680	"	"	"	"	6.4	"
"	A-1681	"	"	"	"	6.5	"
"	A-1682	"	"	"	"	5.1	"
"	A-1683	"	"	"	"	5.8	"
"	A-1684	"	"	"	"	6.9	"
"	A-1685	"	"	"	"	6.7	"
"	A-1686	"	"	"	"	7.3	"

7. The calculations for these stations are complete as to distances and directions, as may be seen by "Pamphlet A-24," of the calculations of the work of Party A.

The lowest point on this line is Station A-1627, at 3.5 meters above the sea level.

8. Without the need of recourse to the data offered by the Commission, it is easy to demonstrate that the point A-1627, with an elevation of 3.5 meters, never was nor will it be inundated by the floods in the rivers.

9. For if that were to happen the whole coast, which has existed from time immemorial between Punta Mona and the Sixaola, would disappear and be flooded under the waters of the ocean and the rivers to a depth of more than 3.5 meters, which is equivalent to twelve and a half feet.

10. Now, taking the data submitted by the Geologist of the Commission in his report (p. 14), the foregoing results mathematically:

The maximum quantity of annual rainfall, observed over a period of six years, amounted to 149 inches, in 1910;

The, run-off, estimated from direct observations upon the ground, reached 0.3 of the amount of the rainfall, and consequently taking the period of heaviest rains, that run-off would amount to 44.7 inches or 1.11 meters; so that the station A-1627 would still be left 2.39 meters above the surface of the water.

But to assume that this height of 44.7 inches would be reached, we would have to suppose something that is of course absurd, that a dam or barrier could be raised to that level of 44.7 inches and that no run-off or discharge could take place until that level had been reached. No; that quantity of rainwater is distributed in the following manner:

(1) Absorption by the soil; enormous in the present case, inasmuch as the valley is very extensive and flat, and the slopes of the basin are steep.

(2) Evaporation, which is considerable, stated by the

Geologist himself in his report (p. 12), where it is said that the mean temperature at the meteorological station close to Changuinola is $\frac{71+85}{2} = 78^{\circ} \text{ F.}$, and the temperature of

the high regions of the basin (p. 13), is $\frac{62+47}{2} = 54.5^{\circ} \text{ F.}$,

while the mean temperature at a height intermediate between the extreme points—the coast and Chirripó

Grande—say at an elevation of $\frac{0+3850}{2} = 1925$ meters,

will be $\frac{78+54.5}{2} = 66.2^{\circ} \text{ F.}$

(3) Absorption by vegetable life, for its growth and development, as well as the consumption by animals.

In an important article by Mr. Joel D. Justin, Associate Member of the American Society of Civil Engineers, published in Vol. XXXIX, No. 6 of the "Proceedings of the American Society of Civil Engineers," August, 1913, p. 1221, we note that the author very properly considers the two items, "slope" and "mean annual temperature," as the principal factors in determining the relation to be established between the amount of rainfall and the run-off.

If we determine the evaporation, by means of the general expression found on page 148 of Mr. Daniel W. Mead's book on "Water Power Engineering,"

$$E = (15.50 + 0.16R) (0.05T - 1.48)$$

in which

E = The annual evaporation (including all losses on drainage area except from run-off),

R = The annual rainfall, and

T = Mean annual temperature,

we find that the evaporation is as high as 71.99 inches.

On page 166 of the same book Mr. Mead establishes the relation between monthly depths of rainfall and run-off, by means of certain diagrams. Entering these curves with the data submitted by the Geologist on page 14 of his report, we obtain the following results:

Month.	Rain-fall.	Depth of run-off.
January.....	13.36.....	11.5
February.....	10.46.....	2.5
March.....	5.62.....	5.0
April.....	12.04.....	5.0
May.....	10.32.....	5.0
June.....	7.79.....	3.0
July.....	14.06.....	4.5
August.....	8.10.....	3.0
September.....	7.77.....	4.0
October.....	5.37.....	3.0
November.....	8.29.....	4.0
December.....	18.68.....	8.0

Making a total run-off of 58.5 inches, which added to the 71.99 for evaporation makes a grand total of 130.49 inches.

But, if it were possible to have any doubt as to the foregoing mathematical calculation, let us even go so far as to concede, what would be the height of absurdity, that

there was no run-off and that there was neither absorption or evaporation, that vegetables and animals did not consume a single drop of water and that a dike 149 inches high was constructed at the lowest station on the line, the elevation of which we saw was 3.5 meters. Such a dike would hold back the entire amount of the rain that fell to the end of the year, but even so, that station lying at an elevation of 3.5 meters would only be submerged 9 inches, while the next one, 220 meters distant from it, having an elevation of 4.4 meters would still be left 27 inches above the water level.

How, then, is it possible to understand that the Commission, having this data in its possession, with the proofs *that the line that was run*, was not and never could be inundated, could have disregarded them for the purpose of substituting therefor an assertion that seriously affects the interests of Costa Rica, by saying that the whole region was inundated when floods prevailed in the rivers?

All the other points upon that localized line were higher still, and so, of course, they were beyond even the very highest floods.

11. It is not possible, therefore, in the face of the data referred to and with a knowledge of these facts, to understand how the Commission could have neglected to apply them, and have substituted therefor an unjustifiable hypothesis.

12. In the accompanying map, Plate No. III, are embraced the data that appear recorded only in the field notebooks; it may be seen that the extreme eastern section of Punta Mona is joined to the one that is left toward the south by the line that starts from the mouth of Middle Creek, and following its course upward it connects with the line that terminates at Station A-1686.

EQUATION OF LINES.

13. Another of the points that need explanation is the one referred to in paragraph 6, Chapter V, of this paper.

It is common among engineers, while at work in the field, if in running new lines, stakes or marks of abandoned lines are met with, to note the equivalence between the abandoned stake and the new one that is set. The purpose of this is to check the levels and to make use of the abandoned work for the better understanding of the topography of the region that is being studied. This is known as "Equation of Lines," and it is not rare to find $A-162 = B-62$.

14. But in the present case the Commission not only repeatedly checked the line that the Engineer of Panama, Doctor Don Abel Bravo, marked and laid down, without any justification appearing therefor in any notebook, but it abandoned the height that ran forming the divide of Middle Creek and which ended at Station A-1686 and branched off at some capriciously selected point as the Panamanian Map of Señor Bravo also branched off to proceed to Punta Mona.

15. That the Commission followed the Panama line, as stated in the foregoing paragraph, is shown quite clearly by the following data taken literally from the field notebooks of Party A.

NOTEBOOK NO. A.

Page 23. Station A-15. At head of Valley.

" 25. " A-18 is old stake, supposed to be
Bravo's line.

" 71. " A-160 = Bravo's 60.

" 71. " A-161 = " 61.

" 71. " A-162 = " 62.

Page		Station A-163 = Bravo's 63.
		“ A-164 = “ 64.
		“ A-165 = “ 65.
“ 72.	“	A-166 = “ 66.
“ 97.	“	A-221 = “ Buena Vista.
“ 97.	“	A-218 = is near Bravo's 124.
“ 121.	“	A-359 = Bravo's 200.

NOTEBOOK 2-A.

Page 56.	Station A-265 = Bravo's 160.
“ 100.	“ A-479 = “ 239.
“ 14.	“ A-68 = Shot to Bravo's Line.
“ 108.	“ A-499 = Bravo's Camp.

NOTEBOOK NO. 3-A.

Page 9.	Station A-303 = Bravo's 294. Panama map.
“ 5.	“ A-587 = “ 287. “ “
“ 17.	“ A-625 = End of branch.
“ 15.	“ A-618 = End of branch A-620.
“ 15.	“ A-620 = Branch line.
“ 11.	“ A-609 = Branch line.
“ 21.	“ A-742 = Bravo's 387. Panama map.
“ 23.	“ A-734 = End of branch.
“ 29.	“ A-766 = End of branch.
“ 31.	“ A-773 = Bravo's 369. Panama map
“ 37.	“ A-790 = End of branch.
“ 39.	“ A-795 = “ “ “
“ 41.	“ A-779 = Bravo's 377. Panama map.
“ 47.	“ A-817 = End of branch.
“ 47.	“ A-806 = Branch line.
“ 49.	“ A-828 = 388 Bravo.
“ 57.	“ A-848 = End of branch.
“ 59 and 60.	Station A-851 = Bravo's No. 392.
“ “ “	“ A-853 = “ “ 394.
“ 141 and 142.	Station A-2136 = Bravo's 483.

NOTEBOOK NO. 4-A.

Page 1. Station A-630 = Bravo's 308.

" 69.	"	A-1178 =	"	452.
" 81.	"	A-1283 =	"	511.
" 119.	"	A-1431 =	"	600.

16. Placing one upon the other the Panamanian tracing made by Doctor Bravo, and that of the Commission submitted by it, the proof of what is being discussed becomes evident, as may be seen by a glance at the tracing referred to in Chapter V.

17. To the present paper two maps are appended, prepared to illustrate what has been stated.

The first one, Plate No. III, contains solely and exclusively the data that the Commission obtained at Punta Mona and in its vicinity across Swamp A, as shown by and as appears from the records in the field notebooks of the respective camps. That map is entitled:

"Map showing the only data taken by the Commission of Engineers at Punta Mona and its surroundings."

18. From this it may be seen that the only traverse line, which was run from the mouth of Middle Creek towards the south, to connect with Station A-1686, was eliminated from the maps of the Commission;

19. That line, as it has been demonstrated in paragraph 10, showed a crest that was constant and never submerged, and which terminated upon the coast near the mouth of Middle Clerk.

20. Upon the second map, Plate No. VI, which was copied from the first one above mentioned, the same data are represented, confined to what is shown by the records of the Commission, and the course described, which the

Commission omitted on the final maps, and for which it substituted the drawing of a new line, indicated by two parallel lines terminating at Punta Mona. And it was in this form, disguised by a fanciful delimitation, that the Commission presented what it called a "*Continuous survey from Cuabre to Punta Mona.*"

21. It should be noted that upon neither of these maps are any level curves or contour lines delineated, since there does not appear in the field books any justification therefor. It is usual for an engineer in charge of a topographical survey, while running a traverse line, to note in his field book at the different stations of the instrument, the cross sections upon the main line that is being laid down, using a hand-level or clinometer that will indicate the gradient to one side or the other of the point in question, and with this annotation it is possible to delineate the contours showing the general topography in the immediate vicinity of the line that is being run.

22. In the present case the Commission did not deem it necessary to take these data, which could have been set down in the note books on the field, and apparently was satisfied to draw "contour lines" deduced solely from the levels taken at two neighboring points, but such a practice has no scientific value in this kind of work. This problem of *contour lines* is too important in the consideration of this controversy for us to refrain from strengthening the reasons that constrain us to refuse to accept them as correct, all the more when there is material therefor.

23. In the Report of the Commission (p. 4), the following language is used:

"The contours are controlled in position by the general knowledge of the country gained by members of the Commission survey parties. In some portions

of these areas sketches made in the field, *but without* instrumental control in these parts form a portion of the basis of the map."

24. The foregoing statement, while it strengthens the present allegation, further declares at the same time, that instruments were not employed for the determination of these lines but they were traced *by the eye*, and not even by those chiefly responsible for the survey, but by their employees.

25. In a matter of a legal character, like the present one, the instrumental data may be conceded and we may even go to the extent of admitting the facts personally gained by employees of the Commission, as being correct, but not the data or facts for the verification of which mathematical operations are indispensably necessary.

26. If the mere sight would serve to determine observations, as it seems to have served the Commission, in the same way it used the time elapsed to run over a course in order to ascertain its length, surveying chains and levels would become quite superfluous. It is, of course, recognized that these instruments are susceptible to error, but means have been found to diminish or render them of little consequence.

27. So while it may be conceded that the rugged bluffs along the heights that limit the course of the Sixaola upon the north do really exist, having been personally observed by employees of the Commission and recognized by the Commission itself, still it cannot be accepted in the same way the *contour lines*, delineated according to the caprice or the fancy of employees in the interior of the territory, and where the difficulties met with, in so irregular a configuration as that to be found there, require the aid of instruments for their solution.

28. Citing but one case only as showing the abuse to which the method adopted by the Commission as regards the *contour lines* has given rise, it is sufficient to refer to what happened in the case of the *traverse line* run to Middle Creek, upon the coast—the levels for which were determined by instruments—and for some unknown reason this line was omitted in the considerations of the Commission.

29. The construction of the map showing the substitution of the line that was drawn upon the maps of the Commission as running to Punta Mona for the line that was run to the mouth of Middle Creek, will be justified by the appending full notes relating to the survey of this last line, as they are found in the field books cited in paragraph 7 of this chapter, and the calculations of which were embraced in Pamphlet No. 24, submitted by the Commission, and are here reproduced:

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
3 A	33	776	311-44-00	69.2	106.9
	33	777	246-57-00	55.7	101.1
	39	796	218-48-00	39.6	94.6
	41	797	273-48-00	55.2	81.1
	41	798	266-36-00	46.2	79.4
	41	799	282-15-00	74.9	83.6 Bravo 377
	41	800	301-40-00	79.2	92.8
	41	801	318-34-00	52.5	94.0
	41	802	301-02-30	58.7	84.9
	43	803	333-36-00	64.9	77.7
	43	804	337-35-00	56.3	89.5
	43	805	260-03-00	68.2	91.7
	49	824	274-56-00	46.3	88.3
	49	825	326-49-00	67.0	87.4
	49	826	349-34-00	31.7	90.3
	49	827	324-22-00	39.0	103.3 Bravo 388
	59	849	254-54-00	52.0	87.2
	59	851	287-35-00	58.4	97.2 Bravo 392

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
3 A	59	852	270-02-00	36.3	98.2
	59	853	284-11-00	51.3	93.9 Bravo 394
	59	854	300-55-00	65.0	95.8
	61	855	296-26-30	57.9	99.4
	61	856	249-19-30	37.8	89.9
4 A	23	893	176-07-00	91.7	63.7
	23	894	182-37-00	46.6	57.3
	23	895	254-53-00	54.5	94.9
	23	896	278-06-00	62.8	94.7
	23	897	310-30-00	45.3	96.1
	25	898	325-37-00	27.9	98.5
	25	899	297-05-00	54.7	98.1
	25	900	333-27-00	20.0	100.8
	25	901	338-44-00	40.2	100.8
	25	902	285-17-00	38.3	91.2
3 A	115	1092	234-16-00	34.5	79.7
	115	1093	211-30-00	57.9	74.8
	115	1094	234-05-00	34.5	74.8
	115	1095	184-57-00	82.6	73.7
	115	1096	190-02-30	37.2	72.1
	115	1097	196-21-00	60.7	68.7
	117	1098	206-00-00	57.1	66.5
	117	1099	179-10-00	41.5	66.3
	117	1100	234-42-30	49.9	63.5
	117	1101	209-09-00	53.0	62.6
	117	1102	229-15-00	31.3	62.3
	117	1103	193-52-00	49.8	57.5
	119	1104	233-48-00	61.1	61.0
	119	1105	166-38-00	27.5	60.0
4 A	53	1127	152-12-00	58.3	52.6
	53	1128	183-01-00	40.6	49.9
	53	1129	187-34-00	56.4	49.0
	53	1130	218-09-00	65.1	56.7
	53	1131	161-59-00	68.0	53.4
	53	1132	159-06-00	29.0	55.9
	55	1133	138-42-00	36.9	59.6
	55	1134	86-35-30	36.9	56.6
	55	1135	55-51-00	41.2	46.1
	55	1136	62-30-00	58.9	48.5
	55	1137	150-04-00	63.3	47.0
	55	1138	186-55-00	44.8	51.4
	57	1139	206-49-30	33.5	46.4

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
4 A	57	1140	171-56 00	67.3	47.0
	57	1141	228 25 00	41.4	43.7
	65	1163	240-38-00	58.5	42.2
	65	1164	229 25-30	45.8	43.1
	65	1165	253-12-00	36.9	48.1
	65	1166	254-48 00	39.3	49.4
	65	1167	268 49-00	27.8	43.9
	65	1168	214-41-00	39.3	53.3
	67	1169	156-46 00	71.3	51.1
	67	1170	209-49-30	42.9	54.4
	67	1171	270-45-00	68.4	55.7
	67	1172	256 16-00	27.4	58.9
	67	1173	162-39-00	42.4	54.0
	67	1174	178 53-00	43.7	59.0
	69	1175	221-21-30	44.7	54.5
	69	1176	176-01-00	38.6	54.3
	69	1177	193-10-00	50.6	57.8
	69	1180	179-12-00	47.6	73.4
	69	1181	281-39-00	16.6	71.6
3 A	129	1201	148-49-00	25.5	77.4
	129	1202	73-04-00	23.1	70.0
	129	1203	138-58-00	46.2	67.7
	131	1204	181-34-00	57.2	68.6
	131	1205	204-59-00	32.4	70.5
	131	1206	181-54-00	52.6	67.9
	131	1207	190-50 00	43.8	75.4
	131	1208	160-16-00	36.8	87.9
	131	1209	202-08-00	61.4	102.5
	133	1210	226-38-00	25.9	105.8
	133	1211	189-42-00	48.5	119.5
	137	1224	278-35-00	52.7	124.9
	137	1225	255-13-00	60.9	129.6
	137	1226	293-20-00	40.0	129.2
	137	1227	294-26-00	18.5	134.9
	137	1228	254-27-00	25.6	131.8
	139	1229	281-31-00	41.5	137.4
	139	1230	264-48-00	32.1	134.8
	139	1231	271-31-00	43.3	127.8
	139	1232	243-30-00	32.9	123.2
	139	1233	227-03-00	56.9	146.2
	139	1234	228-53-00	34.3	145.7
	141	1235	218-42-00	20.2	144.4

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
3 A	141	1236	224-39-00	49.6	164.1 Bravo 483
	141	1237	208-03-00	27.4	180.7
	141	1238	260-12-00	35.3	184.3
	145	1239	260-45-00	19.4	192.7
	145	1240	306-15-00	60.7	188.2
4 A	75	1264	299-22-00	22.6	189.2
	75	1265	325-02-00	34.7	186.4
	75	1266	331-18-00	22.4	180.8
	75	1267	334-50-00	19.8	180.6
	75	1268	09-22-00	24.5	175.0
	75	1269	266-18-00	38.9	176.7
	77	1270	252-38-00	56.0	180.0
	77	1271	290-30-00	25.2	183.8
	77	1272	274-15-00	21.0	180.5
	77	1273	280-31-00	57.2	178.7
	77	1274	257-25-00	40.3	178.5
	77	1275	229-40-30	22.9	187.5
	79	1276	321-47-30	22.6	191.7
	79	1277	303-52-30	57.8	186.1
	79	1091	331-24-30	51.1	176.9
	79	1278	303-44-00	70.7	176.5
	79	1279	304-32-30	56.1	173.1
	79	1280	284-01-00	36.9	178.8
	81	1281	218-57-00	31.8	185.2
	81	1282	250-25-00	57.3	185.0
	81	1283	271-36-00	53.1	194.0 Bravo 511
	81	1284	309-53-00	79.6	188.9
	81	1285	323-35-00	24.1	187.0
	81	1286	303-30-00	77.2	166.2
	83	1287	296-34-00	59.5	166.3
	83	1288	319-04-00	56.0	177.7
	83	1289	290-45-00	67.9	155.2
	83	1290	298-06-00	52.1	158.5
	83	1291	293-05-00	67.2	144.8
	83	1292	280-09-00	62.6	166.7
	85	1293	280-50-00	41.3	175.0
	85	1294	313-05-00	58.5	171.5
	87	1295	271-14-00	68.1	147.0
	87	1296	268-54-30	44.1	166.9
	87	1297	248-36-00	26.9	183.8
	87	1298	260-56-00	34.4	179.3
	87	1299	329-16-00	48.8	151.4

<i>Book.</i>	<i>Pagc.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
4 A	87	1300	317-10-00	69.4	131.6
	89	1301	338-27-00	40.4	144.6
	89	1302	293-19-00	36.4	135.6
	89	1303	269-30-00	48.1	151.5
	89	1304	301-12-00	19.8	147.8
	89	1305	317-46-30	58.1	127.0
	89	1306	312-26-00	46.8	126.8
	91	1307	285-12-30	43.3	128.4
	91	1308	280-40-00	61.9	117.8
	91	1309	281-24-00	41.9	110.4
	91	1310	327-28-00	23.1	106.3
	91	1311	317 04-00	27.3	101.8
	91	1312	278-15-30	65.3	95.1
	93	1313	285-17-00	63.5	79.8
	93	1314	249 22-00	29.1	96.5
	93	1315	262-33-00	17.8	100.9
	93	1316	263-38-00	39.3	102.3
	93	1317	291-25-00	43.1	107.3
	93	1318	258-17-00	61.9	112.4
	95	1319	275-30-00	38.2	109.4
	95	1320	296-21-00	56.5	92.9
	95	1321	256-29-00	50.3	99.1
	95	1322	272-32-00	64.9	86.4
	95	1323	265-34-30	65.9	78.3
	95	1324	293-59-00	36.9	70.1
	97	1325	263-01-00	70.1	84.0
	97	1326	272-19-00	45.8	62.0
	97	1327	249-12-30	65.1	41.1
	97	1328	303-59-00	53.2	35.8
	97	1329	03-04-00	54.3	39.1
	97	1330	281-07-00	47.1	82.6
	97	1331	302-50-00	108.9	61.4
	99	1332	337-23-30	44.0	61.9
	99	1333	313-00-00	35.3	67.1
	99	1334	271-51-30	46.1	64.2
	99	1335	235-46-00	39.8	55.1
	99	1336	184-05-00	61.8	36.4
	99	1337	243-24-00	44.0	43.8
101	1338	170-12-00	68.7	53.5	
101	1339	247-50-00	53.9	46.7	
101	1340	205-14-00	50.5	45.9	
101	1341	140-41-00	42.1	49.0	

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
4 A	101	1342	167-47-00	33.3	49.1
	101	1343	113-47-00	85.1	41.8
	103	1344	156-52-00	59.7	39.9
	103	1345	185-43-30	39.3	40.8
	103	1346	247-04-00	44.5	28.5
	103	1347	160-39-00	76.6	10.3
	103	1348	140-13-00	38.6	17.5
	103	1349	160-44-00	34.3	05.6
	105	1350	205-51-00	106.3	4.9
	105	1351	210-41-00	113.3	3.9
	105	1352	201-20-00	76.3	3.8
	105	1353	205-08-00	70.6	3.7
	105	1354	200-05-00	45.3	3.8
	105	1355	206-09-00	93.3	3.5
	107	1356	208-01-00	45.3	3.5
	107	1357	200-15-00	64.3	3.5
	107	1358	209-35-00	39.8	3.6
5 A	55	1685	118-06-00	47.3	6.9
	55	1686	88-27-00	45.4	6.7
	55	1687	356-04-00	125.8	7.3
	55	1688	19-22-00	98.9	7.9
	55	1689	00-19-30	72.2	9.5
	55	1690	91-30-00	74.4	14.0
	55	1691	91-08-30	105.2	20.0
	55	1692	334-56-00	76.3	8.4
	57	1693	306-15-30	37.3	9.2
	57	1694	329-43-00	42.2	5.8
	57	1695	90-30-00	119.4	21.2
	57	1696	90-25-00	43.6	26.6
	57	1697	97-12-00	100.0	11.8
	57	1698	112-25-00	43.1	27.2
	59	1699	66-41-00	69.3	28.9
	59	1700	132-47-00	69.1	32.9
	59	1701	96-09-00	103.2	29.8
	59	1702	138-38-00	68.9	35.0
	59	1703	164-48-00	89.3	34.1
	59	1704	141-13-30	55.8	34.1
	61	1705	92-18-30	62.0	27.1
	61	1706	94-47-00	51.0	42.3
	61	1707	98-13-00	114.9	42.5
	61	1708	118-09-00	98.4	41.2
	61	1709	121-00-00	77.1	45.4

<i>Book.</i>	<i>Page.</i>	<i>Sta.</i>	<i>Azimuth.</i>	<i>Dist.</i>	<i>Elevation.</i>
5 A	61	1710	150-31-00	65.3	45.2
	63	1711	134-08-00	72.2	41.4
	63	1712	112-24-00	86.8	43.5
	63	1713	141-01-00	95.3	40.7
	63	1714	142-43-00	82.7	40.0
	63	1715	136-32-00	62.8	34.2
	63	1716	95-23-00	59.4	45.5
	65	1717	119-04-00	95.6	45.6
	65	1718	107-22-00	22.4	47.0
	45	1625	323-26-00	243.8	3.5
	45	1626	36-49-00	220.3	4.4
	47	1627	31-33-00	172.8	3.5
	47	1628	26-16-00	174.3	5.5
	47	1629	44-52-00	226.0	5.8
	47	1630	32-04-00	186.9	5.5
	47	1631	23-04-30	139.3	5.6
	47	1632	02-47-00	174.3	6.1
	49	1633	358-45-00	168.6	6.7
	49	1634	354-47-00	114.8	7.1
	49	1635	43-49-00	148.3	7.4
	49	1636	45-44-00	161.2	7.2
	49	1637	46-56-00	155.4	7.2
	49	1638	48-22-00	188.5	7.0
	51	1639	54-00-00	83.3	7.0
	51	1640	66-30-00	169.7	7.9
	51	1641	62-40-30	144.8	8.7
	51	1642	49-04-30	169.6	9.9
	51	1643	49-58-00	194.3	12.4
	51	1644	44-49-00	127.8	14.1
4 A	147	1645	213-31-00	35.3	3.4
	147	1646	226-27-00	99.5	8.4
	147	1647	205-21-00	74.5	4.0
	147	1648	233-18-30	49.3	5.2
	147	1649	257-43-00	96.9	4.7
	147	1650	188-22-00	57.1	5.1
	149	1651	111-49-00	49.7	4.7
	149	1652	173-20-30	74.3	5.0
	149	1653	124-17-30	40.2	9.0
	149	1654	175-35-00	45.0	5.5
	149	1655	229-59-00	46.3	4.5
	151	1656	207-11-00	50.1	28.7
	151	1657	283-38-30	158.1	34.8

Book.	Page.	Sta.	Azimuth.	Dist.	Elevation.
4 A	151	1658	228-24-00	32.6	29.0
	151	1659	277-21-30	106.5	19.2
	151	1660	277-31-00	29.2	18.9
	153	1661	283-19-00	30.5	15.7
	153	1662	255-45-00	96.1	5.2
	153	1663	298-19-00	194.3	2.0
	153	1664	145-44-00	75.0	23.5
	155	1665	106-49-00	51.2	21.6
	155	1666	143-46-00	34.7	18.1
	155	1667	165-05-00	75.6	3.0
	155	1668	165-17-00	93.4	11.5
	155	1669	237-13-00	48.7	1.6
	157	1670	114-58-00	18.4	16.7
	157	1671	129-17-00	41.9	20.1
	157	1672	204-41-00	22.2	21.3
	157	1673	188-34-00	25.3	22.0
	157	1674	168-11-00	71.3	18.3
5 A	157	1675	93-39-00	15.9	15.2
	21	1676	84-00-00	53.9	14.6
	21	1677	100-55-00	23.4	18.4
	21	1678	104-30-00	64.2	16.0
	53	1679	82-59-30	127.3	5.4
	53	1680	70-24-00	128.5	5.9
	53	1681	56-46-00	76.9	6.7
	53	1682	90-08-00	77.6	6.5
	53	1683	06-27-00	63.8	5.1
	53	1684	73-16-00	50.3	5.8
	55	1685	118-06-00	47.3	6.9
	55	1686	88-27-00	45.4	6.7

31. The line to Middle Creek being thus vouched for, the Commission undertook to justify the line to Punta Mona which it substituted therefor, by the use of the following language:

“With this exception *this divide* is well determined, by closely controlled topography depending upon a traverse line run *near* or along it, under, etc.”¹

¹Report of the Commission, p. 55.

32. There are in that paragraph two fundamental errors. The first one is in the reference to "*this divide*," where it is presented as the *main divide*, whereas the fact is that it is no more than the divide *which is the north limit of the area which drains into the Atlantic further south than Punta Mona*. The second, and most important one, is in asserting that such divide "*is well determined by closely controlled topography depending upon a traverse line run near or along it*," for it only needs a glance at the map, Plate No. VI, to be convinced that the line drawn in black is not *near* the traverse line that was run (in red), but that it was distant therefrom at times as far as 3,250 meters, as was the case at the point A-1690, upon the left bank of Middle Creek, and at the place close to Station A-1414, in the survey of Punta Mona.

33. There has been prepared one profile of the traverse line that terminates near the mouth of Middle Creek, using the same data that is to be found in the field books, to which reference has been made. This profile is shown on Plate VIII, entitled: "Profile of the traverse line that follows a permanent divide to the mouth of Middle Creek, together with the profile of the hypothetical line arbitrarily drawn across swamp A."

CHAPTER VII.

THE LONGITUDINAL PROFILE SUBMITTED BY THE COMMISSION.

1. This profile appears upon a single page and it is entitled:

“Profile of the Sixaola River and of the Divide which is the north limit of its drainage area, together with branch divides to the north.”

2. A profile is a section normal to the horizontal plane of a line traced upon a surface, and serving to represent one aspect of the data used to locate the line in question, showing its elevation and the differences in the heights of all the points along such line.

3. But if the points upon the horizontal plan are uncertain, approximate, hypothetical or arbitrary, as some of these appear on the maps of the commission, then the profile that is prepared from those points is also subject to these same anomalies.

4. It so happens that there has come to our knowledge the motive that led the Commission to present such a document and which explains more satisfactorily its existence.

5. It has been said *more satisfactorily*, because it does not appear from the series of questions formulated by the two countries and laid before the Honorable Arbitrator any request made in that respect. Nor is there any indication in the plan formulated by the Commission, approved by the parties and by the Honorable Arbitrator, that the presentation of any such profile was contemplated.

6. But in the "*Estrella de Panama*" (Panama Star, a newspaper published on the Isthmus), on the 26th of July last past, there appeared an interview with Señor Dr. Jorge Boyd by the Editor of that periodical, in which the former made the statement that such a profile had been constructed by the Commission in compliance with one of the requests made thereto by Dr. Boyd himself during the course of the work, he being the Representative of Panama in the Boundary Question.

7. In that interview, are to be found, literally copied, various paragraphs from the Report of the Geologist of the Commission and several notes taken from the General Report, revealing the fact that such data were already within the knowledge and in the possession of Panama, before the Honorable Arbitrator knew anything about them, and, unless the moral responsibility were placed upon the Commission of having communicated its opinion to one of the parties, before it was known by the Honorable Judge who is to give the decision, it might be supposed that this was the result of some confidence on the part of the Engineer of that Republic, and on that account to a certain extent excusable; but what neither is, nor can be a matter of confidence nor excusable, was the fact that appeared in that article in the "*Estrella*," where Señor Boyd declared, in speaking of the documents submitted to the Honorable Arbitrator, using the following language: "Beside there is one special profile, on a single sheet, entitled: 'A combined profile of the River Sixaola and of the drainage from the area of the same river throughout its entire extent,' as far as Punta Mona, *which I particularly asked for in one of my requests to the Commission.*"

7. Compare the translation made by Dr. Boyd with the original title of the map and with what is said in this

respect on pages 2 and 5 of the report of the Commission, and their identity will be manifest.

8. The facts, therefore, appear, as evidenced by Dr. Boyd himself, that the Commission, in the preparation of the profile submitted, did comply strictly with one of the various requests that Panama made to it directly, through its Representative.

CHAPTER VIII.

NEW PROOFS.

1. It has been stated that the line drawn upon the maps as the *Divide of the Sixuola Basin on the north*, does not in any of its intermediary or its extreme points, meet the conditions of the Loubet Award.

As stated elsewhere this demonstration has been founded solely and exclusively upon facts and arguments derived from the reports of the Commission itself.

2. The different portions of that line of uncertain, approximate, hypothetical or arbitrary character, were pointed out and records were produced of another line that combined with the first, and having its same irregularities did not terminate at Punta Mona but near the mouth of Middle Creek, and for this reason, perhaps, was not included or marked upon the maps of the Commission.

3. As a consequence of this demonstration, it is now possible to state the corollary to be drawn therefrom.

No unity of agreement whatever exists between the maps and the reports presented, nor is there any unity or agreement found to exist between the reports and the data obtained for their preparation.

4. These categorical conclusions are strong enough to destroy the arguments against the facts established, and now this seems the proper place to detail the causes which have influenced their appearance in the report.

That is the purpose of the present chapter.

5. It will be for the first and last time, contrary to the plan followed hitherto, that we are compelled to use proofs derived from other sources than those from which all our conclusions have been taken. It could not be otherwise, since it is, indeed, illogical to undertake to prove an irreg-

ularity by the same irregularity; a theorem cannot be demonstrated by using the same hypothesis stated in submitting it.

6. As a preliminary, however, it may be well to state that the proofs about to be offered are also within the knowledge of the Commission and that they were submitted by the opposing party, Panama.

7. It could not be expected, naturally, that Panama would submit documents in this matter that were favorable to Costa Rica. Panama, however, did put into the hands of the Commission the results of its own investigations, its plans and its documents; but it is also true that in so doing it could not have foreseen the use to which they would be put in the course of events;—still the fact is that such data were in the possession of the Commission and if Costa Rica now makes use of them, not however in its own favor but merely to show the reasons for the irregularity of the documents of the Commission, they must be admitted.

8. That these documents to which reference is made were in the possession of the Commission and used by it, is made evident by the detailed citations made therefrom in the course of the present analyses.

These antecedents having been settled, let us now get to the bottom of the matter.

9. (a) The Commission presented a line of the North Divide of the Sixaola Basin, measuring 148 kilometers¹.

(b) Panama submitted to the Commission the plan of the line claimed by it, measuring only 109 kilometers; that is to say, a distance of 39 kilometers less.²

¹See the longitudinal profile prepared at the request of Panama and without the knowledge of the Honorable Arbitrator, as shown in Chapter VII.

²See the plan by Doctor Don Abel Bravo, of December, 1910.

10. Whatever that line may be — the one offered by the Panama Plan,—it does reveal the fact that it followed the crest or summit of a cordillera, which in its lower portion and near the coast coincided exactly with that of the Commission in the course where the Commission designated it as arbitrary and hypothetical¹, but from Buena Vista this line branched off and ran closer to the Sixaola and Telire Rivers until Monte Uren was reached.

11. This Monte Uren, the name of which is found upon the map of Señor Peralta², is situated at $83^{\circ} 29' 00''$ longitude west from Greenwich and $9^{\circ} 38'$ north latitude; and upon the map of Petermann's Mittheilungen, year 1900, Plate 22, at $83^{\circ} 33' 00''$ longitude west from Greenwich and $9^{\circ} 36'$ north latitude,—is not defined as being the Chirripó Grande placed by the Commission at $83^{\circ} 29' 38''$ west of Greenwich and $9^{\circ} 29' 2''$ north latitude, for the difference in latitude is very considerable.

12. At this Monte Uren Panama found that the crest it was following connected with the Cordillera designated upon its map under the name of "Cordillera of Talamanca," at the end of the 109 kilometers measured from Punta Mona; whilst the maps of the Commission connected its line at Chirripó Grande at the end of 148 kilometers from Punta Mona.

13. As has been already stated, it could not be expected that Panama would offer proofs favorable to Costa Rica, but it is clear that such line, if it did exist, would best

¹"It therefore be understood that *there is no actual, permanent, natural divide*, nor parting of the waters across swamp A * * *." Report of the Commission, p. 53.

²PERALTA: *Mapa Histórico Geográfico de Costa Rica y del Ducado de Veragua* (Historical-Geographical Map of Costa Rica and of the Dukedom of Veragua), by Don Manuel M. de Peralta; Madrid, 1892. Special edition for the Fourth Centenary of the Discovery of America.

suit Panama if it were as long as possible, just as it would best suit Costa Rica if it were the shortest possible, as thus each one would obtain the most territory.

Nevertheless, it appears that the survey made by Panama was in December, 1910; that is, some months after the Treaty of Washington was celebrated between the plenipotentiaries, Anderson and Porras; and when the Engineer commissioned by Panama—Dr. Bravo—was surveying this line, he knew that his work would be carefully examined by an impartial commission of experts provided for in that treaty, so that he had every reason for seeking to execute the work as correctly as it was possible to do it.

Doctor Don Abel Bravo, commissioned for that purpose by Panama, undertook those investigations with the aid of a French Engineer, M. Lambert, who had come to the Isthmus during the period the French Canal Company was at work there, and who had located at Bocas del Toro for some years. These two competent engineers, both of them familiar with the region, determined by direct surveys, using the chain, that the distance from Punta Mona to Monte Uren was 109 kilometers. Thus measured and laid down upon their map, it was submitted to the Commission.

14. Notwithstanding this, the Commission deviated from it and showed the distance of 148 kilometers.

15. Neither is the line that Panama offered approved, nor is it admitted that it should be heeded; on the contrary the facts are stated simply for the purpose of establishing a logical comparison between them and deducing the consequences that flow therefrom. If the plans are laid over one another, the Panama Line will be found to lie, in its upper portion, between the divide delineated by the Commission and the Rivers Sixaola and Telire.

16. For greater clearness, the following statement summarizes the comparison:

Panama Line.

1. In its lower portion it coincides with that of the Commission.
2. Panama would naturally be *partial* in the execution of its surveys.
3. Panama did the work with only a single party in the field.
4. Panama proceeded upon an unbroken course from Buena Vista to the Main Cordillera.
5. Panama measured its distances directly with the chain.

Commission Line.

1. In its lower portion it coincides with that of Panama.
2. The Commission must be *impartial* in the execution of its surveys.
3. The Commission did the work with four parties in the field.
4. The course of the Commission was broken between Buena Vista and the Main Cordillera.
5. The Commission measured its distances indirectly, by calculation and some courses by trigonometrical means and others by estimating distances by the time taken to traverse them.

Panama Line.

6. Panama did not abandon its continuous line to Monte Uren, where it declared it found the connection with the Main Cordillera of the crest it was surveying.

Commission Line.

6. The Commission did abandon its continuous line, and went to San José de Costa Rica to undertake it at the other extreme, and by a hypothesis fixing there the connection with the Main Cordillera.

17. It is not strange that after this accumulation of irregularities so great a difference was finally reached between the two distances.

Such an assemblage of mixed data could lead to nothing else but to mistake the facts and, at least, to exhibit them, in a veiled and covered form.

18. As a matter of fact, every one knows that uniform procedure in surveys is the best guaranty of accuracy. The longitude of one of the railway lines from Washington to New York would of course be more correct if its measurement was verified by a direct and uniform procedure than if it were done by sections, using indirect means and even taking as to some portions the method of determining the distance by the time it took a roadman to traverse them.

That is just what occurred in the case of these two surveys, one made by order of Panama and the other by the Commission.

19. Let it be repeated that the measures of Panama are not accepted; they are cited solely for the purpose of comparing them with those of the Commission. These, likewise, are not accepted.

20. As may be seen by the Minutes (Appendix No. 1), the Commission stopped without finishing the studies it was pursuing upon the left side of the Sixaola, and it moved to San José de Costa Rica to take them up anew from a point that it made the terminus of a spur by a hypothesis as untenable as the others.

21. It is evident at once that it was practically quite impossible to know whether that extremity which it had assumed was or was not the terminus of the spur that it had stopped studying,—no one knew if it were, nor could they know. It pointed this out in its declaration very

positively, when it said: “* * * that divide, if such divide exists.”

22. For such a change to have been legal and allowable, and for the connection of the two extremities of the line to have been justified, it would have been necessary and indispensable:

(1) To determine exactly the astronomical situation of a point of the line or of its extremity on the left side of the Sixaola;

(2) To determine in like manner the astronomical situation of a point on the line begun on the side of San José de Costa Rica; and

(3) To connect the extremities of the two lines, correctly calculated in azimuth and distance from the points astronomically fixed.

23. Quite the contrary appears to have been the case; none of these three operations were performed, instead, the connection was made by the use of approximate and uncertain lines, the very start from the extremity of the upper part of the line being altogether hypothetical.

24. That is the reason for the great discrepancy between the two lines and indeed for the grave error of the Commission.

25. The line that Panama drew is not admissible under any theory, but this line along the summit of a cordillera lying quite near to the Sixaola and Telire rivers and their valleys, is an indication of the existence of another high and elevated range between the one traced by the Commission and the same rivers, at the foot of which would then be the line that closes the valley upon the north.

¹Report of the Commission, p. 55.

26. The accompanying map Plate No. VII shows a drawing of the two lines;—the outside one, with a black line, two black lines, two broken lines and an ending of dashes, is the one delineated by the Commission;—while the inside one, traced with a line made up of dots and dashes, is the one drawn by Panama.

27. It has been demonstrated that the one of the Commission is:

(1) *Approximate* from the coast to a point situated at $82^{\circ} 29' 3''$ longitude west of Greenwich and $9^{\circ} 33' 9''$ north latitude.

(2) *Imaginary* and *arbitrary* from Punta Mona to Point A.

(3) *Uncertain* from D-629 to A-2511;—and

(4) *Arbitrary* again from A-2511 to Chirripó Grande.

28. The comparison made of the two lines that have been drawn reveals to us therefore the fact that from Point-A, the location of which is $82^{\circ} 40' 45''$ west of Greenwich and $9^{\circ} 36'$ north latitude, to Buena Vista, the Commission Line is almost the same, with some insignificant variations, as the one delineated by the Engineer Bravo, as also is the hypothetical and arbitrary section that terminates at Punta Mona; but from Buena Vista two lines appear, the divergence of which is notable; the one by the Commission farther to the north and the one of Panama farther to the south and closer to the Rivers Sixaola and Telire.

29. It is evident that arguments by one of the parties that are not based upon data submitted by the experts (the Commission) are without any force before the Honorable Arbitrator, but if these arguments are employed by the opposite party they become proofs of the highest order and of

as much force and value as those presented by the Commission itself. That is just the case here: the line claimed by Panama, one of the interested parties, is shorter and lies inside the one that the experts indicated. Such a situation, as a matter of fact, makes both of the lines doubtful; that of Panama as being biased and that of the Commission on account of having neglected to consider the Cordillera crest that appears to run parallel to the one traced by it and nearer and closer to the Rivers Sixaola and Telire; that is to say, more in accord with the conditions imposed upon the Commission.

30. There was a neglect to characterize the portion to which we have alluded among all the anomalies as to the other sections of this line, but Panama has come to our aid in its designation and to establish with as much effect as the admissions of the Commission that the portion between Buena Vista and Station D-629 constitutes a *doubtful section*.

31. It is therefore worth while to complete the statement made in Paragraph 27 above, by the following addition.

The supposed North divide of the Commission begins at a point the co-ordinates of which are: $82^{\circ} 34' 38''$ longitude west of Greenwich and $9^{\circ} 35'$ north latitude, and it ends at Chirripó at $83^{\circ} 29' 30''$ longitude west of Greenwich and $9^{\circ} 29' 30''$ north latitude.' That line is made up as shown on the following page.

(1) Report of the Commission, page 53.

No.	Portion.	Begins in Long. W. of G., N. Lat.	Ends in Long. W. of G., N. Lat.	Proof.
1	Approximate.....	82° 34' 38" 9° 35'.	82° 39' 3" 9° 33' 9"	(1)
2	Imaginary.....	82° 37' 30" 9° 38' 20"	82° 40' 45" 9° 36' 00"	(2)
3	Doubtful.....	82° 40' 45" 9° 36' 00"	83° 17' 00" 9° 40' 25"	(3)
4	Uncertain.....	83° 17' 00" 9° 40' 25"	83° 25' 45" 9° 34' 20"	(4)
5	Arbitrary.....	83° 25' 45" 9° 34' 20"	83° 29' 30" 9° 29' 30"	(5)

¹Report of the Commission; p. 54.²Report of the Commission, p. 53.³Map of Panama.⁴Report of the Commission, pp. 54, 57.⁵Report of the Commission, p. 57.

32. This shows how the documents presented by Panama have come to constitute the most eloquent proof of the errors in the course followed by the Commission, because they are not only evidence of those errors but they point out and indicate the reason why they originated. Panama could not enter into the territory at San José to assume, as the Commission did assume, the extreme point of the supposed divide line and for that reason its investigation was continued from its beginning at Buena Vista to its ending at Uren.

33. The reasons stated have also justified the use of the arguments foreign to the Report of the Engineers but not foreign to the subject under discussion.

CHAPTER IX.

THE DIVIDE BETWEEN THE WATERSHEDS OF THE TWO OCEANS.

1. The preceding chapters have been devoted exclusively to the analysis of the *supposed divide* limiting the Sixaola Basin upon the north and the conclusions of the previous chapter have summed up the prior ones and demonstrated the mistakes of the Commission, as well as shown the cause and source of those mistakes.

The present chapter will analyze the divide traced by the Commission, supposed by it to separate the watersheds of the two oceans.

2. It should be mentioned here that the corollary stated in paragraph 3 of Chapter VIII, resulting from the examination of the Sixaola divide, is not applicable to this division. On the contrary there is as to this divide a uniformity in the proceedings of the Commission, more unity and a great degree of harmony between the maps and the reports, both of these characterizing it with the frank and honest statement of the truth—"This section is *approximate and uncertain*."¹

3. Indeed, it was demonstrated by unquestionable data that the ending of the divide at Chirripó Grande was in no way justified. The Commission arbitrarily assumed that point, as it could have assumed any other whatever in that region, and the course of three kilometers only which was run toward the northwest from Chirripó is a proof of its arbitrary character.

¹Report of the Commission, top of page 57.

4. In the same way it was seen that the *paramo* or high plateau which was attained at Chirripó Grande, not by any means in a continuous or uniform manner, for the work was stopped and the entire outfit engaged in the survey transferred to San José de Costa Rica, was wide and extensive and it was discussed enough to make it evident that this point was an arbitrary one. There would have been no need for all this argument inasmuch as the Commission itself proclaimed the fact, when it said that “* * * the line from Chirripó Grande to Durika is uncertain. * * *”¹

5. It is proper to observe, now, the mathematical contradiction in which the Commission fails in speaking of the accuracy in the tracing of the North Divide: It states on page 54 that: “The remainder of the divide is drawn as a continuous line indicating that it is known with a considerable degree of accuracy,”—this line is marked thus at *Chirripó Grande*—and three pages further on—top of page 57—it says that: “* * * in the portion from *Chirripó Grande* to Durika and from Dome to Cerro Pando, where there is some uncertainty as to the location * * *” *i. e.*, *Chirripó Grande* is *certain* for the extremity of the line and at the same time *uncertain* for the beginning of the other, which is its continuation.

6. It would be of no consequence that the section from Durika to Dome were correctly localized, if it did not appear joined in a satisfactory way to the two extremities of the divide.

7. The map of Dr. Bravo, a document submitted by Panama, raises again a doubt in this respect; the Main Cordillera is called here “Cordillera de Talamanca” and starts, in this map, from Monte Uren, where the crest that

¹See the conventional signs on map No. 1, sheet No. 1.

begins at Buena Vista terminates. This Panamanian line is enclosed by the uncertain divide drawn by the Commission and as the one is biased by reason of being submitted by one of the parties (Panama) and the other is uncertain according to the declaration made by the Commission itself, it is not possible to solve the question and it ought to be left as an acknowledged uncertainty.

8. It would not be proper to allege that the examination and preparation of the Panama map was wrong, just because so great a difference existed between the two courses. It has been shown that the surveys by Panama were more methodical and more uniform than those made by the Commission, and consequently, in case of a discrepancy, the probabilities are very much greater in favor of the correctness of the Panama map, more particularly as on the very face of the one made by the Commission there is the confession of uncertainty, whilst the Panama map does not suggest any doubt.

9. The portion between Durika and Dome was surveyed by the Commission sending a field party by Punta Arenas (Costa Rica) to Boruca, upon the Pacific side; and thence this field party proceeded by a trail towards the Cordillera, as far as "*Cruz del Obispo*" (the Bishop's Cross), a camping place of our well remembered Bishop of Costa Rica, Dr. B. A. Thiel; but from here the investigations to one side and the other of "*Cruz del Obispo*" concerning the ridge or crest of the Cordillera did not extend beyond Durika upon the west and Dome upon the east.

10. The very situation of the extremity delineated by the Commission is uncertain. The words used "Possibly Cerro Pando," indicate a probability, nothing more, but no certainty.

11. This point seems to be one of vital importance, if it is considered that the error as to its situation, as the Report of the Engineers certifies (p. 59), is greater in an east to west direction than in the north to south direction, for since the upper end of the southern frontier is not fixed, there would be left between the two countries a territory that might be of considerable extent, without any frontier line, nor any way to mark it.

SUMMARY OF THE DOCUMENTS PRESENTED BY THE COMMISSION.

1. After all of these papers have been studied with due attention, it is not difficult to formulate a summary of them.

2. The Report and the Maps of the Commission are distinguished by three essential characteristics:

The first is what they appear to say;

The second is what they really mean; and

The third is what they ought to state and to mean.

I.

The first characteristic does not need any comments.

But, as it has been pointed out, in accordance with all the proofs established, the submerged divide *which ends* at Punta Mona **MUST BE WITHDRAWN FROM THE MAPS; IT BEING A CREATION OF THE COMMISSION AND NOT A FACT OF NATURE.**

II.

3. The result of the analysis demonstrates the second.

Sufficient data are to be found in the documents to

establish the facts, as they have been established, and at the same time there are data enough to annul and destroy those arguments presented which are not in accordance with the actual facts.

4. The truth is always to be found if we go to the bottom of a question, and the contradictions that appear are explained by the same citations and data furnished.

5. The Commission could not have established the irregularities affecting its studies and the maps of the Sixaola and Telire divides any more honestly, nor could it have been less frank in its expression in considering the results of its examination of the divide between the two oceans, than it did in stating that it was left uncertain.

6. Incapacitated by those very irregularities, it would not proceed to formulate the answer to the questions propounded by the two countries—not for lack of data collected, but for want of a method for their analysis.

7. The Commission from its inception being led by the erroneously preconceived idea of a *divide*, at the very outset upset the methodical plan that would have conducted to the establishment of the truth without any circumlocution, in a clear and definite way. The Sixaola *divide*, “* * * if such divide exists * * *,” always was and it will be one of the things perhaps least needed in the whole question, but this secondary and insignificant matter was considered by the Commission as the *sole and only object* of its investigations. This was the basic reason for all of its mistakes.

8. The effort to give credit to an unjustifiable hypothesis, laying down *a priori* a theory so foreign to the question

and trying to convert it into the object of the question itself, notwithstanding all the probability to the contrary, and despite the clearness and conciseness of the conditions and documents within the control of the Commission indicating that it should be an analytical investigation, devoid of any preconceived element, led it to deductions at variance with the real significance of the facts, but which it has been easy to demolish with the same trustworthy data that appear in the papers themselves.

III.

9. In the preceding paragraph the intimation was made for the first time of the reason for all the mistakes pointed out in the analysis, and that was *the method adopted*.

10. The Commission well knew the subject matter upon which it was to give an expert opinion and the causes that had given rise thereto. This appears from the data that it communicated and is shown by the first 35 pages in its report. Therein may be found the whole of the original Loubet Award, the Anderson-Porras Treaty, the questions propounded by the two countries and the plan under which the investigations were to be made. This plan held already in embryo the bad system adopted by the Commission, and indeed paragraph (a) of that plan said:¹

“A topographical survey from Punta Mona along the divide which is the north limit of the drainage area of the Tarire or Sixaola River to its junction with the Main Cordillera.”

11. This first clause of Plan V, which seems to give to it the character of a study or investigation, is correct, but not as the basis and admitted object, not as an accom-

¹Report of the Commission, p. 12.

plished fact which it should be sought to demonstrate by the use of every sort of argument and even imaginary suppositions.

12. The Commission, in the discharge of its duties and having proved that Punta Mona is isolated by an enormous *swamp*, that separates it from the rest of the main land, ought to have stopped there so far as regards clause (a) of said report (p. 12), establishing the fact that *no divide starts from Punta Mona*, but that this locality is found upon a basin foreign to that of the Sixaola, and not even contiguous thereto, for that might give rise to doubt and still more, if any divide did exist there, that divide is not the one that limits upon the north the basin of the Sixaola.

13. On the contrary, however, the Commission, instead of all this, settled *a priori* as existing in fact what it ought to have studied and proved, whether it did exist or not; and hence the origin of all its irregularities and mistakes.

14. The Commission changed the *subject of study* into the *basis of study*. Clause (a) of Plan V, cited (p. 12, Report of the Commission), was a *subject proposed*, not an *admitted conclusion*. As a subject or theory it was allowable; but not as a conclusion or fact. This clause was headed: "The survey is to embrace * * *": the plan did not say, " * * * it is a fact that * * *."

15. It has, then, been purely a question of method, and if instead of taking the *supposed divide* for granted, the Commission had devoted its efforts to investigating the reality or the supposition of the fact stated, it would then have proceeded in compliance with its duties.

16. The course taken by our studies of this matter has brought out the continuous tendency that is noted in the documents, to try to establish such a *divide*, contrary to the

real facts, even going so far as to employ an erroneous and false hypothesis, shown to be so by the very data furnished by the Commission itself.

17. If instead of considering as demonstrated what it should have taken up as something to be demonstrated, the Commission had proceeded in an analytical way to search for the truth, its methods and conclusions would have been altogether different. *To get the topography of the entire territory and from it deduce all the facts as they really and actually exist*; that was the whole of its mission, in its double character, technical and expert; but from the very moment that it devoted itself, without regard to the means, arguments or the hypotheses used, to the effort to demonstrate one of the things presented solely for investigation, treating it as it were an *accomplished fact*, the Commission disregarded its duty and converted itself into an advocate, getting away from the question.

18. It is true that this question was proposed by Panama, but it was in conditional terms. Panama said:¹ "If any such branch, secondary divide or counterfort exists * * *", a phraseology of which the Commission also made use when it stated "* * * if such divide exists * * *",² and saying this too after all the investigations that had been made which should have developed whether it did or not exist.

19. The object of all this conditional part, like all the others of the questions submitted, was to have the Commission establish or reject it;—to either accept it in view of the data that might be secured in its favor, or deny its correctness after considering all the facts opposed to it; but contrary to what was expected, the Commission

¹Report of the Commission, bottom of page 21.

²Report of the Commission, p. 55 (¶ 2).

assumed its existence as certain, without any premises authorizing it, although the party interested submitted it as doubtful.

20. The logic of these facts is so irresistible, that the arguments would be the same if the Commission instead of assuming as an accomplished fact one of the things presented in a conditional form by Panama, had taken up one of those submitted by Costa Rica. For example, it would not have been admissible for the Commission to have persisted in an effort to demonstrate the nonexistence of the *supposed spur*, if in order to do so it became necessary to have recourse to pre-historic hypotheses in the field of geology or to those common to the present epoch. That was the manner in which it did proceed,—in the first case under the theory of a submergence and in the second under the erroneous supposition of an inundation, in the attempt to arrive at a demonstration that fell by its own weight and could not resist the slightest analysis.

21. The recourse to hypotheses is excluded in expert opinions.

22. As already stated, the greatest source of error was the method adopted. In order to secure all the requisite data the Commission was called upon to furnish, the logical and impartial procedure would have been to once having shown the course of the Sixaola, to take cross sections at convenient intervals, perpendicular to the axis of the current of the river. No opinions would thus have been advanced nor hypotheses offered, either ancient or modern, but with the simple facts that were collected it would have been easy to answer the questions propounded and to state the real and actual facts regarding the region. Those cross sections could have been prolonged as far as the *divides*, if it were desired, without relying upon any data

or document offered by either one of the parties, which the Commission had the right to disregard and was even under obligation to put aside, as dangerously compromising its impartiality in the discharge of its duty.

23. It is proper to say here, at the conclusion of this third division, that the first reading of the opinion of the Commission was a source of real surprise. A frank and ingenuous statement of the facts had been expected: In a paper entitled "The Manzanillo Basin" and prepared on the 14th of May of last year, after making the general statement, the writer said:

"From the foregoing allegations, which will appear in all their fullness and detail in the work and reports of the Commission, the following facts are evident:

1. That the place called Punta Mona is found to be situated upon a watershed directly upon the ocean, characterized by rivers of this second basin or watershed, being absolutely independent of the basins of the Sixaola and the North River.

2. That the foregoing conclusion establishes without any question that no line that starts from Punta Mona can reach, in any direction it may be traced, any valley or any other place that directly or indirectly belongs to the River Sixaola, without first cutting and traversing this second watershed, entirely foreign to the watershed or basin of the Sixaola."

The paper ended as follows:

"The investigations that are now being carried on by the surveying Commission will show the perfect distinction between the basin of the Sixaola and that of Manzanillo."

24. Assuredly, to these very conclusions we have in the end arrived, not, however, as had been expected, in the form of a clear and precise statement, but by means of a *well founded criticism* and by the *force of the facts*.

LUIS MATAMOROS,
Consulting Engineer of Costa Rica.

Washington, D. C. September 19, 1913.

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APPENDIX.

APPENDIX I.

PHOTOGRAPHIC VIEW NO. 125.

1. It has been abundantly shown in this study that the theory of the North Divide is wholly foreign to the question now in litigation, for the French Arbitrator, as has been repeatedly stated, never referred in this connection to any divide whatever, but to a spur or counterfort which he supposed existed, closing on the north the valley of the Tarire, or Sixaola River, and which, starting from Punta Mona, ended in the chain that separated the waters of the two oceans.

2. It has also been established that if the Commission undertook the location of that divide, they should have treated it as a mere detail or as information for use in illustrating their study, but under no circumstances as the principal subject of their inquiry; much less should the Commission have adopted it as a basis for its conclusions, which apparently is what was done.

3. Because, even in the event that that divide as shown on the maps and reports had been topographically correct, such conclusions would still have been without value on account of the admitted fact that *no spur or counterfort whatever exists which starts from Punta Mona and continues uninterruptedly to a terminal in the cordillera dividing the waters of the two oceans and which, at the same time, closes on the north the valley of the Talire and Sixaola rivers.*

4. This indisputable proposition, which is in itself alone enough to upset the conclusions of the French Award, remains in full force and vigor, based as it is upon the incontrovertible facts and arguments presented in the maps and reports of the Commission and detailed at great length in the present report.

5. Nevertheless, the positive establishment of this truth is so important to a just determination of the present litigation that no discussion tending in any manner to throw more light on the point can be looked upon as a work of supererogation.

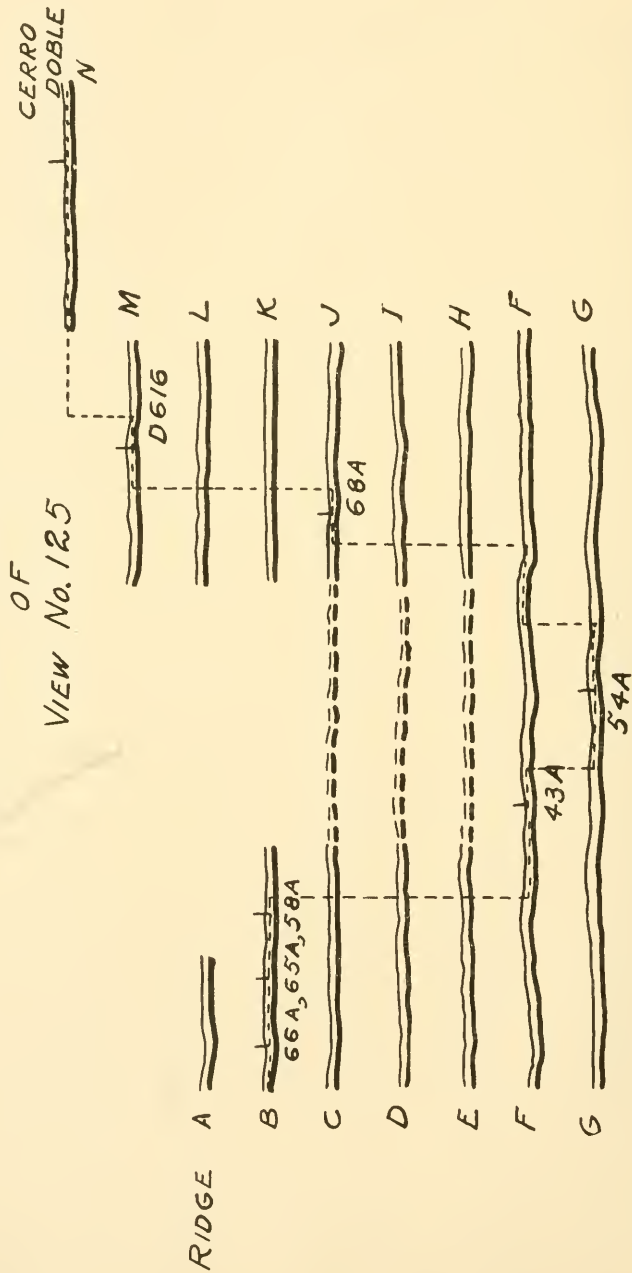
6. For the determination of a real and material fact science offers many resources—and none more simple, none more exact and eloquent than photography. By means of this process the real and material facts as they exist impose themselves upon the human mind before all other considerations; they are made to stand forth by the aid of this art in defiance of and in the face of the craftiest arguments of the logician, of the most exact maps of which the hand of man is capable—subject as they are to imperfection and error—and even in the face of contradiction of mathematical deductions.

7. Precisely of this character is the final evidence adduced as to the indisputable proposition above mentioned.

8. In fact, photographic view No. 125, which the Commission presents in its report (Vol. 4, Appendix No. 4) suffices in itself to give full light to the truth and could in strict justice be held to render negligible any contradictory contentions on this point.

9. It is also true that, as in the case of the reports of the engineers in the field corps, the Commission did not give to this document—the most important of all that have been presented—the merit to which it is entitled; that body contented itself with tracing between stations D616 and Cerro Doble, which appear in the said photograph, the line of the North Divide, which is drawn on the maps as a continuous ridge between those stations, leaving out the other points shown in the photograph, which also form part of the Divide.

DIAGRAM SHOWING PLAN



10. The filling in of this omission is the sole labor that remains to be preformed in this connection, and this Chapter will undertake the task in the fewest possible words.

11. According to the Commission¹ the photographic camera was located at some 410 meters towards the north of Station A2480 on the Divide, and at the respective azimuths of 202° , 232° and 252° were taken the views numbered 120, 121 and 122, which together compose the view numbered 125A, and later known as No. 125, and finally the view which is the subject of this Chapter, enlarged for greater clearness.

12. In this view it not only appears that the Commission marks D616 and Cerro Doble as forming the North Divide, but that from the same point are also taken peaks 66A, 65A, 58A, 43A, 54A, and 68A which in the same way pertain to the Commission's Divide, as may be seen on the maps.

13. These stations occupy the following positions on the maps of the Commission:

<i>Location.</i>	<i>Station.</i>	<i>Longitude W. of Greenwich.</i>	<i>N. Latitude.</i>
North Divide....	66A	$83^{\circ} 20' 00''$	$9^{\circ} 40' 00''$
North Divide....	65A	$83^{\circ} 20' 04''$	$9^{\circ} 39' 50''$
North Divide....	58A	$83^{\circ} 20' 15''$	$9^{\circ} 39' 32''$
North Divide....	43A	$83^{\circ} 23' 50''$	$9^{\circ} 36' 40''$
North Divide....	54A	$83^{\circ} 20' 12''$	$9^{\circ} 39' 32''$
North Divide....	68A	$83^{\circ} 21' 40''$	$9^{\circ} 37' 30''$
North Divide....	D616	$83^{\circ} 16' 30''$	$9^{\circ} 40' 50''$
	Cerro		
*North Divid	Doble	$83^{\circ} 10' 20''$	$9^{\circ} 38' 50''$

¹Report of the Commission, Vol. 4, Appendix No. 4, page 13.

14. These points having been thus fixed, it is enough to glance at the photograph in order to be convinced:

FIRST.

That the stations 66A, 65A and 58A are found to be in the same file, or ridge, B.

SECOND.

That in order to continue the Divide from 58A on the ridge B to station 43A on the ridge F, it has been necessary to cut across the ridges C, D, E, with their corresponding deep depressions, to reach the ridge F whereon is located point 43A.

THIRD.

That in order to go from 43A to point 54A in the Divide, it has been necessary to descend ridge F and ascend ridge G.

FOURTH.

That from ridge G, whereon is located station 54A, in order to reach ridge J, whereon is located station 68A, it has been necessary to cross ridges F, H, I, and one side of J.

FIFTH.

That from ridge J, station 68A, it is necessary to cross ridges K, L and M in order to reach station D616, which the Commission connects directly with Cerro Doble.

15. From these five propositions—apparent from a simple glance—the irresistible conclusion results that NO CONTINUOUS SPUR OR COUNTERFORT OR CORDILLERA WHATSOEVER EXISTS THAT CLOSES ON THE NORTH THE VALLEY OF THE

SIXAOLA AND TELIRE RIVERS, but that, on the contrary, the supposititious Divide is itself formed by a group of ridges alternating with deep ravines that place beyond the possibility of doubt the fact that there is no regular and continuous spur or cordillera.

16. To make perfectly clear these facts shown in photographic view No. 125, attention is called to the accompanying diagram. On it the ridges are designated with the same letters that are used on the photograph, and the dotted line indicates the course of the Divide.

Ridge A is the most distant. Then follows ridge B, whereon are located stations 66A, 65A and 58A; but from this point it is necessary to cross the ridge C, D, E in order to reach 43A on ridge F; from that point on F, 54A ridge G is reached, and then, this time recrossing F, and afterwards H and I, ridge J is reached, whereon is located station 68A; but from this point, in order to reach D616, it is necessary to cut across ridges K, L, and M.¹

17. The Commission assumes that D616 connects with Cerro Doble along the ridge, but if the photograph is examined, or a glance taken at the above diagram, it will be seen that stations D616 and Cerro Doble are not in the same chain contrary to the indication of the maps.

The merest glance at the photograph shows that station D616 is on ridge M, which lies at a considerable distance from ridge N, whereon is located the Cerro Doble station.

It will be seen that ridge N loses itself exactly in the direction of the station 69A between ridges K and M, ridges K and N being nearer the camera than ridge M. The error in the maps is therefore incontrovertibly established by this photograph.

¹ It may be possible that ridges E and H, D and I, C and J, be respectively the same ridge, but this does not change the argument.

18. It is impossible to conceive a simpler and more evident demonstration of the fundamental principle which has been established, to-wit, the non-existence of a counterfort or cordillera on the site fixed by the Survey Commission on its maps as the divide north of the Sixaola and Telire Rivers.

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